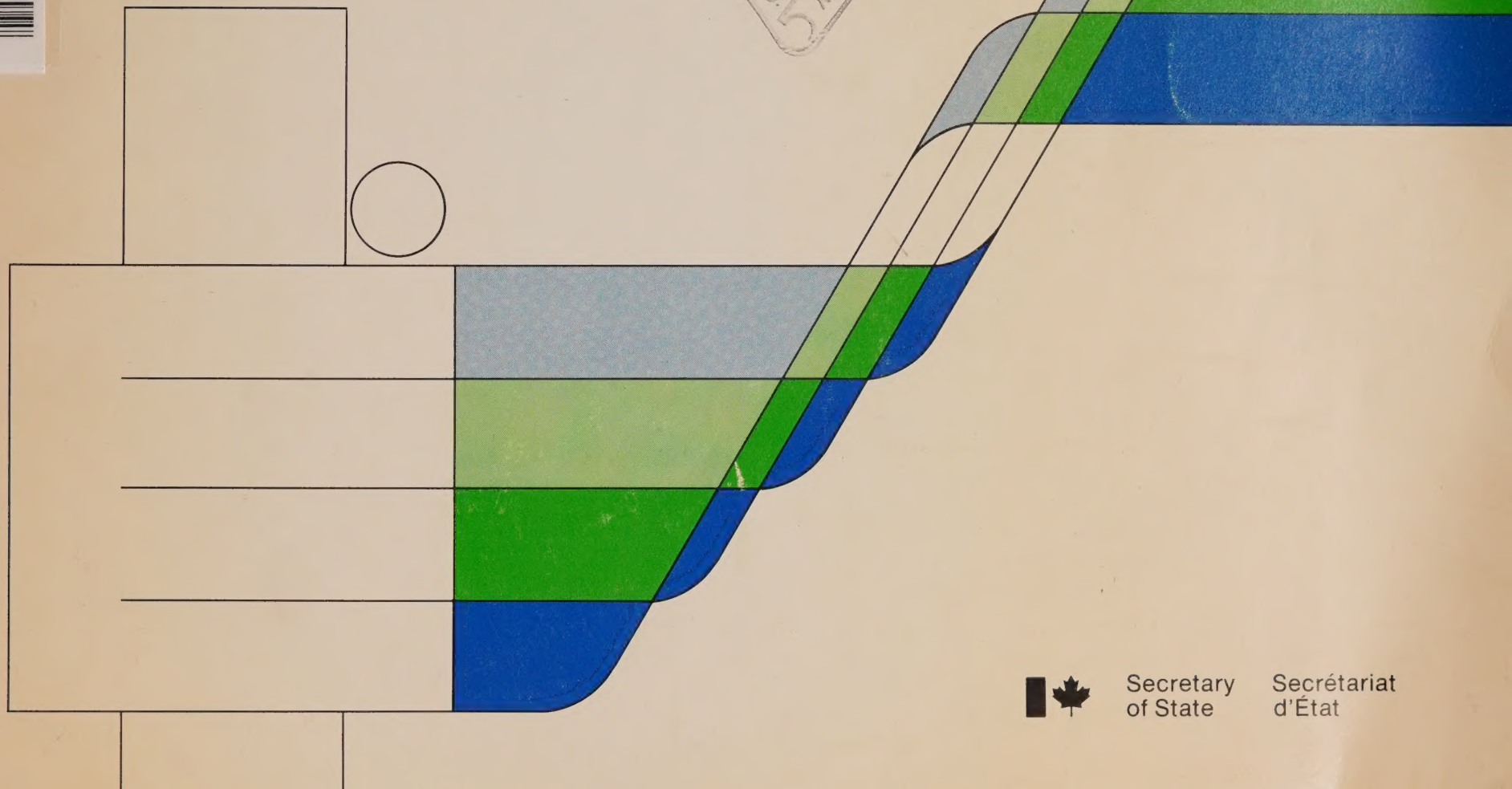


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DEGREE-HOLDERS IN CANADA

An Analysis of the Highly Qualified Manpower Survey of 1973

by

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Department of the Secretary of State

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Table of Contents

Foreword	v
List of tables in text	vii
List of figures in text	vii
CHAPTER 1: INTRODUCTION	
Background	1
The Highly Qualified Manpower Survey, 1973	2
Some limitations of the data	2
Design of this report	2
CHAPTER II: SOME BASIC DATA	4
CHAPTER III: PARTICIPATION IN THE LABOUR FORCE	6
CHAPTER IV: TYPE OF DEGREE	11
CHAPTER V: AGE AND YEARS SINCE GRADUATION	
Introduction	16
Age distribution of occupations	16
Years since graduation for all degree-holders	17
Years since graduation for doctorate-holders	18
Conclusions	18
CHAPTER VI: OCCUPATION AND MAJOR FIELD OF STUDY	
Introduction	29
Major fields of study of degree-holders in given occupations	29
Occupational employment for particular fields of study	31
The utilisation of degree-holders	33
Some conclusions on occupations and major field of study	33
CHAPTER VII: OCCUPATIONAL MOBILITY	
Introduction	53
Basic data on occupational mobility	53
Factors affecting occupational mobility	54
Patterns of movement from one occupation group to another	56
Conclusions	57
CHAPTER VIII: GEOGRAPHIC MOBILITY	
Introduction	67
Basic patterns of migration	67
Migration status of employed degree-holders	69
The migration of Canadian-educated degree-holders	70
Conclusions	71
CHAPTER IX: THE EARNINGS OF DEGREE-HOLDERS	
Introduction	86
Distribution of earnings	87
Age-earnings profiles	87
Conclusions	88

CHAPTER X: SOME SEX DIFFERENTIALS

Introduction	106
Occupations of male and female degree-holders	106
Field of study and type of degree	106
Earnings differences by occupation	107
Age-earnings profiles	108
Conclusions	109

CHAPTER XI: ESTIMATED EARNINGS FUNCTIONS BY AGE

Introduction	120
Some basic considerations	120
Formulation of the model	121
Data for the model	123
Regression results	123
(a) Geographic factors	124
(b) Demographic factors	124
(c) Education factors	125
(d) Employment factors	126
(e) Occupational factors	126
Some conclusions on the determinants of earnings	126

CHAPTER XII: ESTIMATED DIFFERENCES IN EARNINGS BY SEX

Introduction	128
Method and data	128
Regression results	128
(a) Geographic factors	130
(b) Demographic factors	130
(c) Education factors	130
(d) Employment factors	131
Conclusions	131

CHAPTER XIII: CONCLUSIONS AND IMPLICATIONS

Introduction	132
Some implications for manpower planning models	133
Education and earnings	133
Some suggestions for further research and additional data	134

BIBLIOGRAPHY.....136

APPENDIX I: SOME LIMITATIONS IN THE SURVEY DATA 138

APPENDIX II:

(a) CLASSIFICATION OF MAJOR FIELDS OF STUDY USED IN THIS REPORT	139
(b) AGGREGATED GROUPS OF OCCUPATIONS USED IN THIS REPORT	139
(c) DETAILED OCCUPATIONS USED IN THIS REPORT	141

Foreword

In 1973, Statistics Canada carried out a post-census sample survey of persons reporting a university degree in the 1971 Census. The survey, known as the 1973 Highly Qualified Manpower Survey, covered roughly 138,000 persons, 96,000 of whom submitted completed questionnaires. The data collected in the survey include field of study, level of degree, occupation and earnings of the selected degree-holders in 1973. Data on marital status, number of children in the home, occupation and earnings in 1971 were also available for the same degree-holders from their 1971 census returns. This information therefore provides a rich base for carrying out social and economic research on degree-holders in Canada.

Some of the survey data have been released by the Ministry of State for Science and Technology and Statistics Canada in the form of cross-tabulations of the important variables. The detailed data have also been stored on magnetic tape at Statistics Canada and are available for research and analysis.

Although the survey data refer to a period five years ago, they are nevertheless relevant for current decision-making in the university sector. For example, the data on the occupations held by graduates in different fields of study indicate the type of employment opportunities that have been open to degree-holders. Moreover, these data can be examined for different age groups in order to study the career patterns graduates have followed. Both types of information are useful for students in choosing the careers they plan to follow, and for universities in responding to changes in employment opportunities for graduates in different fields of study.


This report represents the first major analytical study of the survey data. It was designed to provide a general description of the main findings of the survey, as well as an analysis of some specific topics. It was hoped in this way to illustrate both the scope of the data base and its potential value as a basis for further applied research.

The report was prepared in the Education Support Branch of the Department of the Secretary of State, with considerable assistance from the Education, Science and Culture Division of Statistics Canada. Bill Ahamad was the principal author. The other authors were Jeff Greenberg, Jocelyn Desroches and Ralph Mitchener (Department of the Secretary of State) and Nancy Cartier and Anne

Bowen (Statistics Canada). The charts were prepared by François Cadoret (Statistics Canada) and Nicole Dallaire (Department of the Secretary of State) using the EDP systems of the Research and Information Services Division of the Ministry of State for Science and Technology.

A number of people provided valuable comments on a draft of the report. We are particularly grateful to Sylvia Ostry (Economic Council of Canada); Pierre-Paul Proulx (Université de Montréal); Edward Sheffield (Professor Emeritus of Higher Education, University of Toronto); Eva Ryten, Jenny Podoluk and Max von Zur-Muehlen (Statistics Canada); Arek Bandzierz and Ron Knowles (Ministry of State for Science and Technology); and Robin Rowley (McGill University).

R.J. Lachapelle
Director General
Education Support Branch



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List of Tables in Text

Chapter III

- Table III.1** Activities of degree-holders for twelve-month period prior to response, by sex

Chapter VII

- Table VII.1** Occupational (detailed) change by industrial change, 1971-73
Table VII.2 Occupational (detailed and aggregate) change, 1971-1973
Table VII.3 Occupational (aggregate) change by educational change, 1971-1973
Table VII.4 Occupational (aggregate) change by change in province of residence, 1971-1973

Chapter VIII

- Table VIII.1** Percentage of degree-holders who completed secondary schooling in a given province working in Ontario in 1973
Table VIII.2 Percentage of persons who took first degree in a particular province, with highest degree from Quebec or Ontario

Chapter X

- Table X.1** Female earnings as a proportion of male earnings for selected occupation groups by type of degree (per cent)

Chapter XI

- Table XI.1** Explanatory variables used in analysis
Table XI.2 Number of observations and adjusted coefficients of determination for regression equations
Table XI.3 Estimated regional variation in earnings compared to Ontario (\$)
Table XI.4 Estimated earnings differentials (\$) for demographic variables
Table XI.5 Estimated earnings differentials (\$) for education variables (compared to variable in parentheses)
Table XI.6 Estimated earnings differentials (\$) by employment status (compared to those who worked in a full-time job for 40 or more weeks)
Table XI.7 Estimated occupational earnings (\$) differentials (compared to persons in managerial and administrative occupations)

List of Figures in Text

Chapter III

- Figure III.1** Participation in labour force by sex and by major field of study of last highest degree
Figure III.2 Participation in the labour force by age and sex
Figure III.3 Females in the labour force by age, marital status and presence of children

Chapter IV

- Figure IV.1** Distribution by major field of study of first and highest degrees
Figure IV.2 Proportion of degree-holders with more than one qualification

who specialised in the same and different fields for first and highest degrees

- Figure IV.3** Degree level by major field of study for persons employed at some time in the twelve months prior to the survey
Figure IV.4 Degree levels for selected occupations

Chapter V

- Figure V.1** Age distribution of all degree-holders reporting an occupation
Figure V.2 Age distribution for selected occupations: managerial and administrative and social science occupations
Figure V.3 Age distribution for selected occupations: teaching, health & law occupations
Figure V.4 Age distribution for selected occupations: engineering and natural science occupations
Figure V.5 Distribution of years since graduation by type of degree
Figure V.6 Distribution by type of degree for different years since graduation
Figure V.7 Distribution of years since graduation for selected major fields of study: education and humanities
Figure V.8 Distribution of years since graduation for selected major fields of study: social science and engineering
Figure V.9 Distribution of years since graduation for selected major fields of study: health and physical sciences
Figure V.10 Distribution of years since graduation for doctorate-holders (who worked 40 or more weeks full-time) in selected fields of study

Chapter VI

- Figure VI.1** Proportion of persons with a university degree in selected occupations in 1971
Figure VI.2 Selected major fields of study by occupation: managerial and administrative occupation group
Figure VI.3 Selected major fields of study (aggregated) by occupation: managerial and administrative occupation group
Figure VI.4 Selected major fields of study by occupation: architects and engineers
Figure VI.5 Selected major fields of study by occupation: social sciences and religion
Figure VI.6 Selected major fields of study by occupation: teachers
Figure VI.7 Selected major fields of study (aggregated) by occupation: teachers
Figure VI.8 Selected major fields of study by occupation: health & law occupations
Figure VI.9 Selected major fields of study by occupation: Occupations in natural sciences and mathematics
Figure VI.10 Selected occupations by major field of study: education fields
Figure VI.11 Selected occupations by major field of study: humanities and related
Figure VI.12 Selected occupations by major field of study: social sciences and related fields
Figure VI.13 Selected occupations (aggregated) by major field of study: social sciences and related fields
Figure VI.14 Selected occupations by major field of study: engineering fields
Figure VI.15 Selected occupations by major field of study: mathematics and science

- Figure VI.16** Selected occupations (aggregated) by major field of study: general arts and science
- Figure VI.17** Proportion of "non-degree-oriented" occupations by major field of study
- Figure VI.18** Proportion of "non-degree-oriented" occupations by major field of study and level of degree

Chapter VII

- Figure VII.1** Occupational change 1971-73, by age and sex
- Figure VII.2** Occupational change 1971-73, by province of residence
- Figure VII.3** Occupational change 1971-73, by major field of study
- Figure VII.4** Occupational change 1971-73, by type of degree
- Figure VII.5** Occupational mobility 1971-73, by occupation group
- Figure VII.6** Sex distribution of persons in selected occupation groups who had changed occupation groups in 1971-73
- Figure VII.7** Proportion of persons who changed occupation in 1971-73 by age, for selected occupations
- Figure VII.8** Occupational change 1971-73, by field of study, for selected occupation groups
- Figure VII.9** Distribution of persons who moved out of selected occupation groups by occupation group of in-mobility (1971-1973)

Chapter VIII

- Figure VIII.1** Proportion of degree-holders who took first degree or were employed in 1973 inside and outside province of secondary school completion
- Figure VIII.2** Proportion of degree-holders who took their highest degree inside and outside the province of their first degree
- Figure VIII.3** Proportion of degree-holders employed in 1973 inside and outside province of highest degree
- Figure VIII.4** Net inflows (+) and outflows (-) between province of secondary school completion and province of first degree (000's)
- Figure VIII.5** Net inflows (+) and outflows (-) between province of highest degree and province of employment in 1973 (000's)
- Figure VIII.6** Proportion of degree-holders who took highest degree inside and outside province of employment in 1973, by province
- Figure VIII.7** Proportion of degree-holders who took highest degree inside and outside province of employment in 1973 by age-group
- Figure VIII.8** Proportion of degree-holders who took highest degree inside and outside province of employment in 1973, by type of degree
- Figure VIII.9** Proportion of persons with a doctorate who took highest degree inside and outside province of employment in 1973, by major field of study
- Figure VIII.10** Proportion of degree-holders in selected occupation groups who took highest degree inside and outside province of employment in 1973
- Figure VIII.11** Geographic mobility of Canadian-educated degree-holders by province of employment, 1973
- Figure VIII.12** Geographic mobility of Canadian-educated degree-holders by age
- Figure VIII.13** Geographic mobility of Canadian-educated degree-holders by type of degree
- Figure VIII.14** Geographic mobility of Canadian-educated degree-holders by occupation in 1973

Chapter IX

- Figure IX.1** Distribution of earnings (1973) for selected occupations
- Figure IX.2** Distribution of earnings (1973) by province, for administrators in teaching & related fields
- Figure IX.3** Distribution of earnings (1973) by province, for university teachers
- Figure IX.4** Distribution of earnings (1973) by province, for secondary school teachers
- Figure IX.5** Distribution of earnings (1973) by province, for physicians & surgeons
- Figure IX.6** Distribution of earnings (1973) by province, for civil engineers
- Figure IX.7** Distribution of earnings (1973) by province, for all degree-holders
- Figure IX.8** Age-earnings profiles for males in selected occupations (a)
- Figure IX.9** Age-earnings profiles for males in selected occupations (b)
- Figure IX.10** Age-earnings profiles for males with different specialisations, for selected occupations (a)
- Figure IX.11** Age-earnings profiles for males with different specialisations, in selected occupations (b)
- Figure IX.12** Age-earnings profiles for males with degrees in social sciences, for selected occupations
- Figure IX.13** Age-earnings profiles for males by type of degree, for selected occupations (a)
- Figure IX.14** Age-earnings profiles for males by type of degree, for selected occupations (b)
- Figure IX.15** Age-earnings profiles for male university teachers in specific fields
- Figure IX.16** Age-earnings profiles for male university teachers, by type of degree

Chapter X

- Figure X.1** Occupational distribution by sex
- Figure X.2** Sex composition of occupation groups
- Figure X.3** Distribution of degree-holders by major field of study, by sex
- Figure X.4** Sex composition of highest degree, by major field of study
- Figure X.5** Sex composition, by type of degree
- Figure X.6** Average (mean) earnings (1973) by occupation group & sex
- Figure X.7** Age-earnings profiles for males and females in selected occupations (a)
- Figure X.8** Age-earnings profiles for males and females in selected occupations (b)
- Figure X.9** Age-earnings profiles for males and females with degrees in education, for selected occupations
- Figure X.10** Age-earnings profiles for males and females with a masters degree, for selected occupations

Chapter I

Introduction

Background

There has been an enormous expansion in the post-secondary sector in Canada over the past twenty years. Both universities and non-university institutions, such as community colleges, have shared in this expansion; and, although the rate of increase in university enrolments has been much smaller than that in non-university institutions, university enrolments still account for slightly over 60 per cent of total full-time enrolments in all post-secondary institutions (See [33]).*

There are many reasons for this expansion, the bulk of which occurred in the sixties, and these have already been discussed elsewhere (see, for example [30]). At that time, it was generally believed that the lower educational investment in Canada than in the U.S. was one of the main reasons for the lower labour productivity, and hence for the lower economic growth, in this country. For example, the Economic Council of Canada argued in its Second Annual Review that there was "... a general shortage of manpower with higher educational and skill qualifications. The shortages... (were) most severe at the professional and university level... (and constituted) one of the major obstacles to be overcome in achieving a satisfactory rate of improvement in productivity and of economic growth in Canada" ([12] p. 170). Thus, it seemed clear that a higher level of investment in professional and university education would yield substantial benefits to the Canadian economy.

This interest in investment in higher education gave rise to a wide range of research studies on manpower and educational planning. Some of these dealt with forecasting the manpower required to meet the projected growth of output in the economy [1], others dealt with the economic costs and benefits of investment in education [39], while others still were concerned with the economic effects of the migration of highly educated persons [27]. The *1967 Survey of Scientists and Engineers* was undertaken by the Department of Manpower and Immigration "... to establish a basis of information on the resources of highly qualified manpower in Canada for the further development of policies and research in this field..." ([5] p. 1); the results of the *1967 Survey* were published in 1970 in a report entitled "*Canada's Highly Qualified Manpower Resources*".

*Numbers in square brackets refer to the bibliography at the end of the text. Full details of author, publisher, etc. are to be found on page 136.

The *1967 Survey* covered some 91 thousand individuals whose names and addresses were obtained "...from a variety of sources including the Scientific and Technical Personnel Register previously maintained by the Department of Labour, directories of professional associations, surveys of graduating classes of Canadian universities and government departments" ([5] p. 41). Thus, by definition the persons included in the *1967 Survey* consisted of a mixture of university graduates and members of professional associations who might not have had a degree. In addition, the survey covered only architects, engineers, and physical, life and social scientists, so that many other types of educated manpower, such as physicians and surgeons, were excluded.

In 1970 the Science Secretariat (now the Ministry of State for Science and Technology), in cooperation with the Dominion Bureau of Statistics (now Statistics Canada) and other interested federal departments and agencies, formed a working group to investigate the feasibility of carrying out a post-census survey of highly qualified manpower [34]. It was later agreed that a sample survey of persons reporting a university degree in the 1971 census should be undertaken, and this was carried out by Statistics Canada in 1973. Many of the survey data have been released by the Ministry of State for Science and Technology and Statistics Canada in the form of detailed cross-tabulations of the more important variables. In addition, some specific sub-sets of the data have already been analysed and reported elsewhere (see for example [14], [29] and [34]).

The purpose of this report is to provide a general description of the characteristics of degree-holders in Canada, using data from the Highly Qualified Manpower Survey of 1973. In addition, some selected topics, such as the earnings of degree-holders, are analysed with a view to making policy recommendations.

It should be noted that this report deals only with data from the *1973 Survey* and no attempt has been made to compare these data with those from the *1967 Survey*. Such a comparison of the two data sets is clearly important since it may provide some valuable insights into the changes in highly qualified manpower which have taken place over the period. However, since the population included

and the definitions of highly qualified manpower used in the two surveys differed considerably, it was felt that the comparison of the two data sets would be more appropriate at a later stage and after a comprehensive analysis of the 1973 Survey data.

The Highly Qualified Manpower Survey, 1973

The survey questionnaire was distributed in September 1973 to a sample of approximately 138,000 (of the 720,000) persons who reported in the 1971 census that they had a university degree. About 96,000 persons (nearly 70 per cent of the sample) completed usable questionnaires; the others included persons who did not respond for the usual reasons (refusal, death of the selected person, etc.) as well as a number of "no degree" cases. (Details of the survey methodology and the reliability of the results are discussed in [32].)

The data collected in the survey covered a limited range of topics: educational qualifications, field of study, labour force status, current earnings, and employment at different points in time. However, the survey was linked to the 1971 census so that census information could be obtained for each respondent. As a result, the data tape covers a fairly wide range of topics: secondary schooling, immigration status, marital status, ethnicity, earnings and employment in 1970, and so on. Thus the data are unique in Canada and they provide a valuable basis for analysing some important issues in manpower and education planning.

For example, the data may be used to investigate the determinants of the earnings of degree-holders and the differences in earnings over age and for different groups in the population. Similarly, the data can provide a better understanding of the geographic mobility of degree-holders and the moves they make during the course of their education and employment. The data on the occupations and earnings of persons in different fields of study can be used by students as a basis for assessing the career opportunities which may be open to them. The employment of female graduates in different occupations and at different times in their lives may be used to provide a better understanding of male-female differences in earnings and in career patterns. In short, the data form an important input for social scientists and policy makers in planning the efficient utilisation and distribution of degree-holders in Canada.

Some limitations of the data

As noted above, the questionnaire covered a limited range of topics so that the data cannot be used to analyse all of the current concerns in higher education. For example the data cover degree-holders only and do not include graduates from community colleges or other non-university post-secondary institutions. College graduates in some fields are probably good substitutes for degree-holders in particular jobs so that the earnings and employment of the latter will depend to some extent on the availability of the former. The non-university post-secondary sector has expanded very rapidly in recent years, and it seems reasonable to assume that this expansion would have had some effect on the labour market for degree-holders, and vice-versa. It has not been possible to examine these questions because of lack of data.

Similarly, no direct information was collected on the extent to which degree-holders use their qualifications in the performance of their duties. Thus it is difficult to determine whether or not degree-holders are fully utilised in the jobs they hold or if degrees are in some sense necessary for the efficient performance of certain jobs. Similarly, data were not collected on the time spent by new graduates in finding their first full-time jobs and on the changes in their career aspirations which might have been necessary in order for them to obtain those jobs. Thus it has not been possible to examine the extent of unemployment and underemployment of new graduates.

In addition, no information was collected on the education, occupations and incomes of the parents of degree-holders. This means that it has not been possible to study the extent to which the inequalities in social status and incomes in Canadian society are transmitted from one generation to the other through the education system. (See [13] for some recent data on this question). Similarly, no information was collected on the abilities of individuals, or on the perquisites and non-monetary aspects of different occupations; these are difficult to measure, but they are probably important determinants of the earnings of degree-holders.

A number of other limitations arise because of the design of the questionnaire. For example, respondents were asked to report their incomes and activities in the twelve months prior to completion of the questionnaire, or for calendar year 1972. Thus the reference period will vary for respondents because of differences in response dates. The effects of this and other limitations of the data are discussed in detail in Appendix I.

Design of this report

As noted above, one of the objectives of this report is to describe some of the characteristics of degree-holders in Canada. Since only a few analyses using the survey data have been published to date, it was felt that the report should be fairly general and should cover all rather than only specific groups of degree-holders. It was hoped that in this way the conclusions from the analysis would be applicable to a wide range of degree-holders.

One of the major advantages of the data base is that information is available for detailed occupations and fields of study. This means that the data may be used to examine in detail the characteristics of very specific groups of degree-holders, such as physicians and surgeons, government administrators with a degree in social science, or secondary school teachers with a degree in mathematics. It was felt that the potential for detailed analysis should be illustrated in the report, so that the researchers in federal and provincial government departments, in universities, in professional associations and in research organisations would be encouraged to carry out further or more detailed analyses.

These two objectives — a general report covering detailed occupations and fields of study — are difficult to achieve simultaneously without making the report extremely large and difficult to read because of the introduction of large and detailed tables of statistics. An attempt has been made to circumvent this problem by presenting most statistics in the text in the form of graphs or charts.

Detailed statistical tables are available on request from the Education Support Branch.

The specific major fields of study of degree-holders have been classified by Statistics Canada (see [25]) at three levels of aggregation: detailed (98 categories) intermediate (45 categories) and aggregated (9 categories). Most of the analysis in this report has been carried out using the aggregated classification of major fields of study, but selected detailed fields of study have often been used for specific analyses. An attempt has been made to indicate clearly the level of classification being used at particular points in the report. However, any confusion which may arise can probably be cleared up by reference to Appendix II where the exact titles used have been specified.

The same is true of the occupations of degree-holders. Generally an aggregate classification of occupations into 20 categories has been used for most of the analysis. In some cases, however, a detailed classification of occupations into 115 categories has been used. The occupation titles used in the two classifications are reproduced in Appendix II.

Since the report is aimed at a fairly wide and varied audience including interested members of the public, the analysis in the text is mainly non-technical; references to further technical work are provided when necessary.

The chapters which follow cover a wide range of topics. Chapter II sets the stage for the study with some basic data on degree-holders in Canada — their numerical size, fields of study, occupations and earnings. Chapter III describes the principal activities of degree-holders and investigates the effects of age, sex, and field of study on participation. The type of degree held by degree-holders is examined in Chapter IV and their distribution by years since graduation and by age is discussed in Chapter V. Chapter VI deals with the relationship between occupation and education and examines both the fields in which persons in various occupations had specialised and the occupations in which persons with various specialisations were working. The occupational changes of degree-holders in the period 1971-1973, and their geographic mobility as measured by residence at different times form the topics of Chapters VII and VIII. The earnings of degree-holders by province, field of study and occupation are discussed in Chapter IX. Chapter X examines male-female differences in field of study, occupation and earnings. Chapter XI deals with a statistical model to estimate the effects of various factors on the earnings of degree-holders, and a similar model is used in Chapter XII to estimate the separate effects of these factors for males and females. Some conclusions and policy implications are discussed in Chapter XIII.

Appendix I describes some of the limitations of the data. The classification systems used for occupation and field of study are included in Appendix II.

Chapter II

Some Basic Data

The Highly Qualified Manpower Survey indicates that about 630 thousand of the 720 thousand degree-holders reported in the 1971 Census of Canada were still living in this country in 1973. Roughly 226 thousand (36 per cent) had obtained more than one qualification by 1973: 92 thousand had a masters degree, 27 thousand had a doctorate and 107 thousand had a second bachelors degree or a post-graduate or post-bachelor diploma or certificate.

More than half of the degree-holders in the survey had taken their highest degree in the social sciences (23%), in education fields (18%) or in the humanities (15%). However, these proportions varied with the level of degree: thus 22 per cent of persons with a bachelors or with a first professional degree in medicine, dentistry or veterinary sciences, but 18 per cent of those with a doctorate, had specialised in the social sciences. Nearly 28 per cent of doctorate-holders had specialised in mathematics and physical sciences.

The most popular of the individual detailed fields of study was secondary school teaching: 41 thousand degree-holders had specialised in this field. Some other popular fields of study were: general arts (35 thousand), commerce or business administration (35 thousand), family or general practice medicine (27 thousand), English language and literature (25 thousand) and law (24 thousand). The most popular engineering fields were civil engineering (18 thousand), electrical engineering (16 thousand) and mechanical engineering (15 thousand).

The majority of all degree-holders were men. Women accounted for only 31 per cent of the total. The proportion of women declined substantially with the level of degree so that only nine per cent of all doctorate-holders were women. Most of the individual detailed fields of study were dominated by men: for example, more than 90 per cent of specialists in fields such as architecture, civil engineering, law, dentistry, commerce or business administration, and religious studies were men. However, in some fields (such as nursing, library and archival sciences, social work, English language and literature, general arts and anthropology) the number of women exceeded the number of men.

Roughly 552 thousand degree-holders reported that they had an occupation at some time in the twelve months prior to the survey. The two largest occupation

groups based on the 20-category classification in Appendix II were elementary and secondary school teaching and related occupations (20%) and managerial and administrative occupations (20%). Some of the largest individual detailed occupations, based on the 115-category classification in Appendix II, were secondary school teachers (79 thousand), elementary and kindergarten teachers (28 thousand), physicians and surgeons (27 thousand), university teachers (27 thousand) and administrators in teaching and related fields (25 thousand).

The occupational distribution of males and females was quite different. For men, the most important occupation group was managerial and administrative occupations: 24 per cent of all men reporting an occupation were in this group. For women, the most important occupation group was elementary and secondary teaching and related occupations: 36 per cent of all women reporting an occupation were in this group.

Eighty-seven per cent of male degree-holders, but only fifty per cent of female degree-holders, had worked in a full-time job for 40 or more weeks in the year prior to the survey. A further eight per cent of men and 22 per cent of women reported some part-time work for the same period.

In general, degree-holders were highly paid. The average (mean) earnings of those who worked on a full-time basis for 40 or more weeks in the twelve months prior to response (which corresponds roughly to the year to October 1973) were \$16,500. Male degree-holders also earned considerably more than females: thus the average earnings for full-time workers were \$17,800 for men and \$10,800 for women.

Average earnings also varied considerably by occupation. Some examples of the average earnings of males and females in various occupations are: \$20,000 for male and \$14,300 for female government administrators, \$11,400 for male and \$10,200 for female social workers; \$19,100 for male and \$14,300 for female university teachers; \$12,500 for male and \$11,300 for female secondary school teachers; \$36,400 for male and \$20,300 for female physicians and surgeons.

Nearly 147 thousand degree-holders (about 23 per cent of the total) had been

born outside Canada; of the foreign-born degree-holders, 70 per cent had completed their secondary schooling, and 62 per cent had obtained their first degree, outside Canada. Nearly half (48%) were residing in Ontario in 1973, although a substantial proportion were living in Quebec (19%). Foreign-born degree-holders also formed varying proportions of the total number of degree-holders resident in each province in 1973. The largest proportions were in British Columbia (29%), Ontario (27%) and Alberta (24%).

In 1973, 21 per cent of degree-holders who had completed their secondary schooling in Canada were living outside the province of their secondary school completion. The out-migration of secondary school graduates was particularly large for Saskatchewan and Prince Edward Island: in each case more than half of the secondary school graduates in the province were living in a different province in 1973. Ontario gained the most from the migration of Canadian secondary school graduates: 41 thousand (37% of those who were living outside the province of their secondary school completion) were residing in Ontario in 1973.

The pattern of migration was similar for those who had obtained their highest degree in Canada: in 1973, 21 per cent were living in a province other than that of their highest degree. The largest losses were for New Brunswick (54%), Saskatchewan (48%) and Nova Scotia (47%). Ontario was again the main residence of the migrants: 38 thousand (35 per cent of those living outside the province of their highest degree) were living in Ontario.

Chapter III

Participation in the Labour Force

Respondents to the Highly Qualified Manpower Survey were asked to provide information on the number of weeks spent on various activities in the twelve-month period prior to response. The activities included those normally associated with labour force attachment (working in a full-time job, working in a part-time job, not working but looking for work) as well as those not usually considered to be labour force activities (going to university or school, keeping house, retired, other). However, since the reference period was twelve months, it is not possible to calculate the usual labour force participation rate and unemployment rate which are based on principal activity in a particular reference week. Thus, individuals who did not work in a full-time job during the twelve months prior to response could have spent some weeks in a part-time job, some weeks looking for a job, some weeks going to school and so on. A further complication is that some teachers evidently failed to count their vacation time as part of the time they spent in a full-time job, so that the estimates here will be biased downwards.

Because of these difficulties and of the need to keep the analysis simple, the activities of degree-holders have been classified on the following basis. Persons who spent no time working or looking for work, that is those not in the labour force at any time during the twelve-month period prior to response, are grouped in one of the following categories: kept house, attended school, retired and other. Individuals in the labour force were divided into five groups: (1) worked 40 or more weeks in a full-time job; (2) worked 40 or more weeks but not all in a full-time job; (3) worked up to 39 weeks in a full- or part-time job and looked for work for one or more weeks; (4) worked up to 39 weeks in a full- or part-time job but did not look for work; (5) did not work but looked for work.

These groups are not completely satisfactory for analysis but they do provide approximate indicators of the extent of attachment of degree-holders to the labour force. For example, although group (1) could include a small number of persons who had been unemployed for a short time during the year, it consists mainly of persons who were fully employed for the year. Similarly, group (2) roughly represents persons who were involved in the labour force on a part-time basis for the full year. Groups (3) and (5) cover mainly persons who had been unemployed and looking for work at some time in the year while group (4) roughly represents those who were apparently satisfied with limited attachment to the labour force.

The data in Table III.1 show that about 96 per cent of all males and 72 per cent of all females had had some attachment to the labour force in the twelve months prior to the survey. As might be expected, the attachment for males was mainly in the form of full-time work: 87 per cent of males had worked in a full-time job for 40 or more weeks during the period. For females, the pattern of participation was quite different: only 50 per cent had worked in a full-time job for 40 or more weeks of the period. At the same time slightly over one-fifth of females had participated in the labour force on a part-time basis.

These differences are much the same for persons in different fields of study (Figure III.1). Thus, for any given field of study, the proportion of males in the labour force was much higher than that for females. Moreover, for males the variation in the proportion across fields of study was small so that males showed a high attachment to the labour force irrespective of their specialty. The same was not true for females, however, and for them field of study appears to be an important determinant of labour force participation. Thus, for females, the proportion in the labour force was lowest for persons who had taken general arts and science degrees, and this was 27 percentage points below the proportion for graduates in health fields. One possible explanation for this is that female graduates in fields which are highly vocational, such as education and health specialties, may have a wider range of job opportunities open to them than female graduates in fields which are not specifically job-vocational, such as general arts and science.

As would be expected, age also appears to play an important role in labour force attachment (Figure III.2). For males, the proportion in the labour force was highest for the age range 30-54: this is not surprising since this age range forms the main part of the working life of a male. The proportion was somewhat lower for males under 30, many of whom would have still been at university, and for males over 54 when retirement from the labour force normally commences.

Females had a lower attachment to the labour force than men for almost all age-groups shown. However, the effects of age were quite different for males and for females. The proportion of females in the labour force declines sharply with age to a low point for those at the end of the childbearing age, and then rises

TABLE III.1
Activities of Degree-Holders for Twelve-Month Period
Prior to Response, by Sex

ACTIVITY	MALE	FEMALE
	(%)	(%)
In Labour Force		
1. Worked full-time, 40 or more weeks	87.3	49.5
2. Worked not all full-time 40 or more weeks	1.5	5.1
3. Worked full- or part-time up to 39 weeks, and looked for work	2.3	3.9
4. Worked full- or part-time up to 39 weeks, but did not look for work	4.6	12.1
5. Did not work but looked for work	0.4	1.0
Sub-total	96.1	71.6
Not in Labour Force		
6. Kept House	0.1	23.2
7. Attended School	1.2	1.4
8. Retired	2.6	2.8
9. Other	0.2	1.1
Sub-total	4.1	28.6
Per Cent ¹	100.0	100.0
TOTAL		
Number (000)	435.5	194.9

¹Figures may not add to 100 per cent because of rounding errors.

slightly before retirement age. Thus the attachment of females to the labour force shows two peaks, one for the youngest degree-holders who had a very high attachment to the labour force, and the other for those aged 45-54. This pattern is consistent with the notion that women form part of the so-called secondary labour force to suit the social and economic circumstances of their families.

The effects of age on the labour force attachment of females are more clearly seen in Figure III.3. For single women (with no children) the proportion in the labour force was high for all age groups and was in general fairly close to that for males. For married women, attachment to the labour force seems to be strongly affected by the presence of children under 17 in the home; the proportion of married women with children under 17, and in the labour force, was roughly constant for those aged 25-54 although the proportion for the age group 30-34 was slightly below that for the other age-groups. By contrast, the proportion for those with no children under 17 varied substantially with age, and the double peaks noted above are quite apparent. This indicates that the presence of children of school age in the home is an important determinant of the labour force participation of female degree-holders.

FIGURE III.1 Participation in labour force by sex and by major field of study of last highest degree

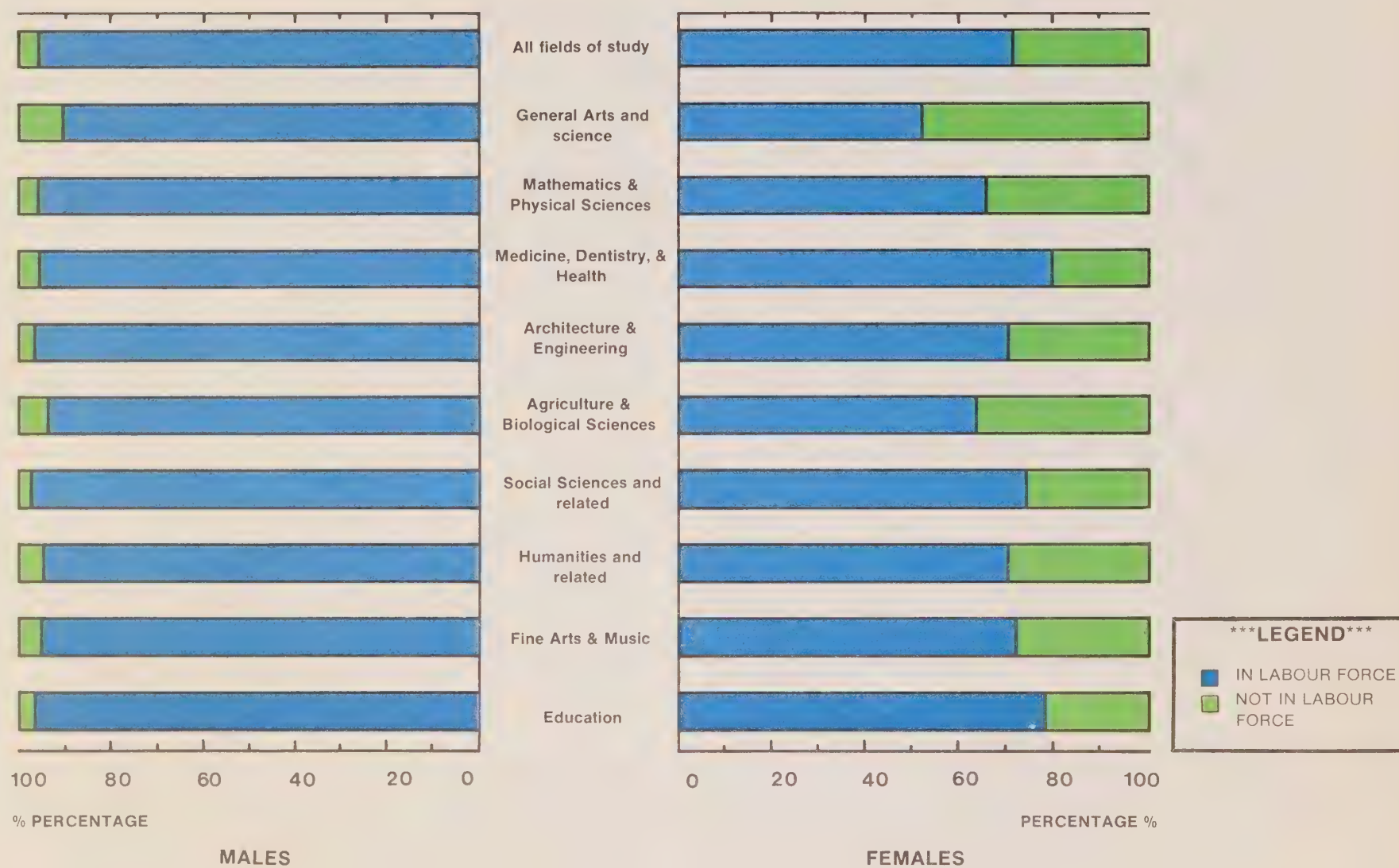


FIGURE III.2 Participation in the labour force by age and sex

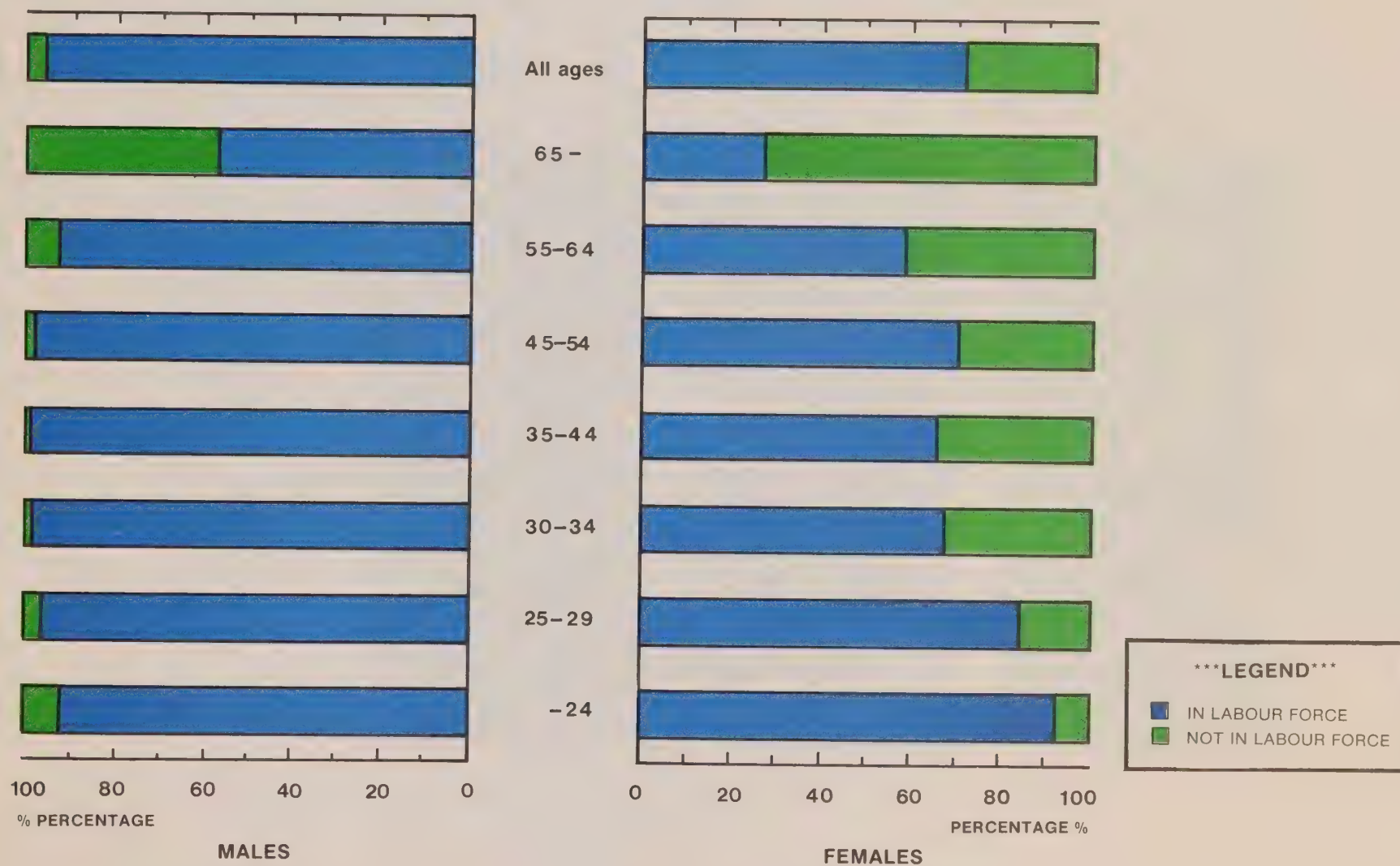
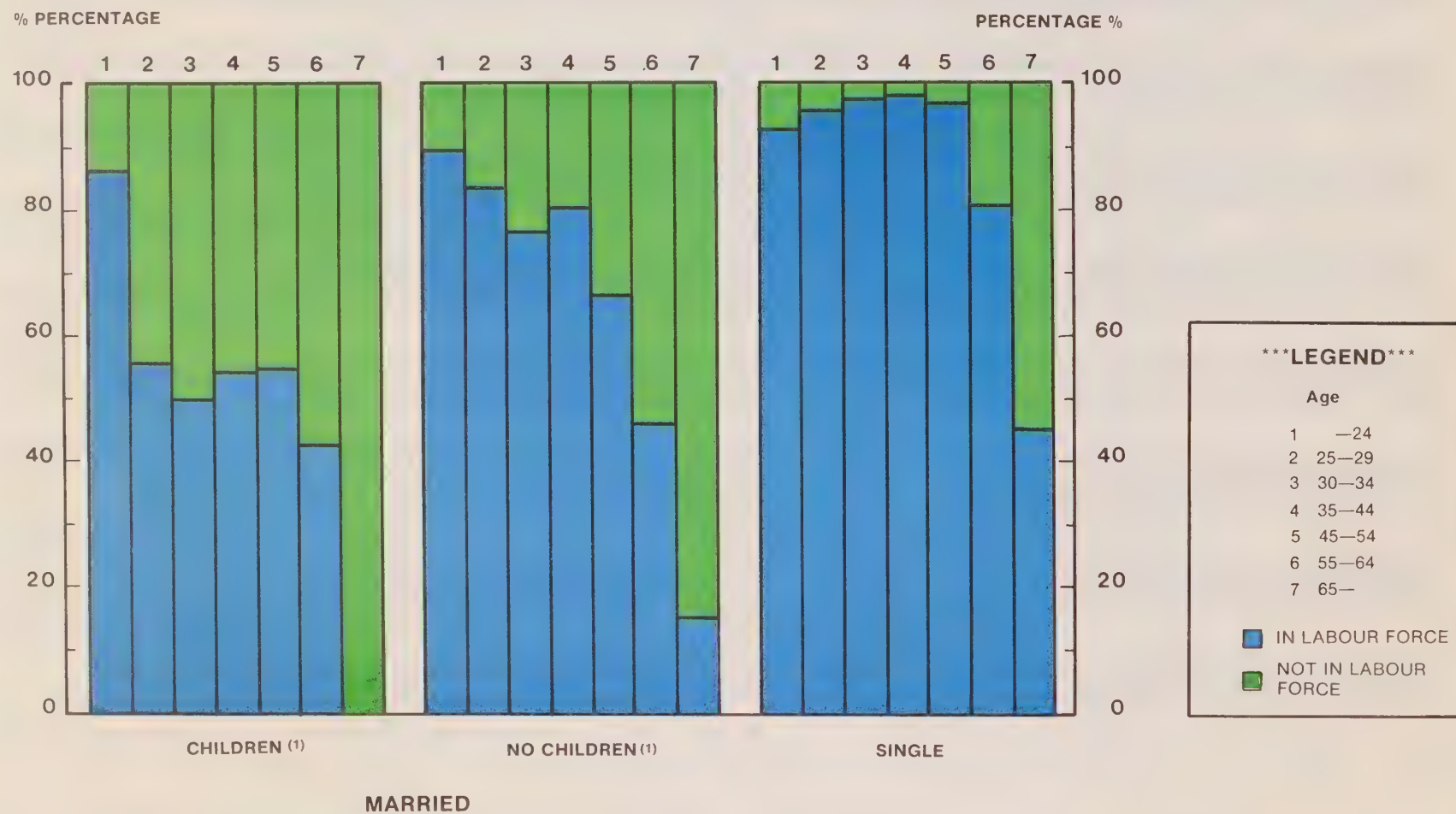


FIGURE III.3 Females in the labour force by age, marital status and presence of children



(1) Children/No children under 17 present in home in 1971.

Chapter IV

Type of Degree

Most of the analysis in this report has been carried out on the last highest degree of respondents, since it was felt that this would be more appropriate for analysing such factors as income and occupation. For example, many graduates in medicine or dentistry hold a first degree in arts or science, but this probably has little direct relevance to their incomes or occupations. Similarly, a post-graduate or post-bachelor diploma or certificate in education has often been a requirement for certain types of teachers so that the use of first degrees may give a poor indication of the importance of such qualifications. Finally, although both first and last degrees may be relevant for some jobs — for example, the income of a manager of an engineering firm may be high because he has degrees in both engineering and social science — the errors generated by ignoring the effects of the first degree will probably be fairly small.

The distribution of persons by major field of study (aggregated) was much the same for both first degree and highest degree (Figure IV.1). For example, roughly one-fifth of all first degrees and of all highest degrees were in the social sciences; similarly, 15 per cent of degree-holders had taken their first degree, and 17 per cent had taken their highest degree, in the humanities. Two notable exceptions were general arts and science, which is by definition an undergraduate field, and education which is a popular choice for a second qualification because of the requirements for teaching jobs.

The proportion of persons with different specialisations for the first and highest degrees was very large only for education and medicine, dentistry and health fields (Figure IV.2). Thus if these two fields were ignored, the number of persons with different specialisations in their first and last degrees would only be about 65 thousand, which is slightly more than 10 per cent of the stock of degree-holders.

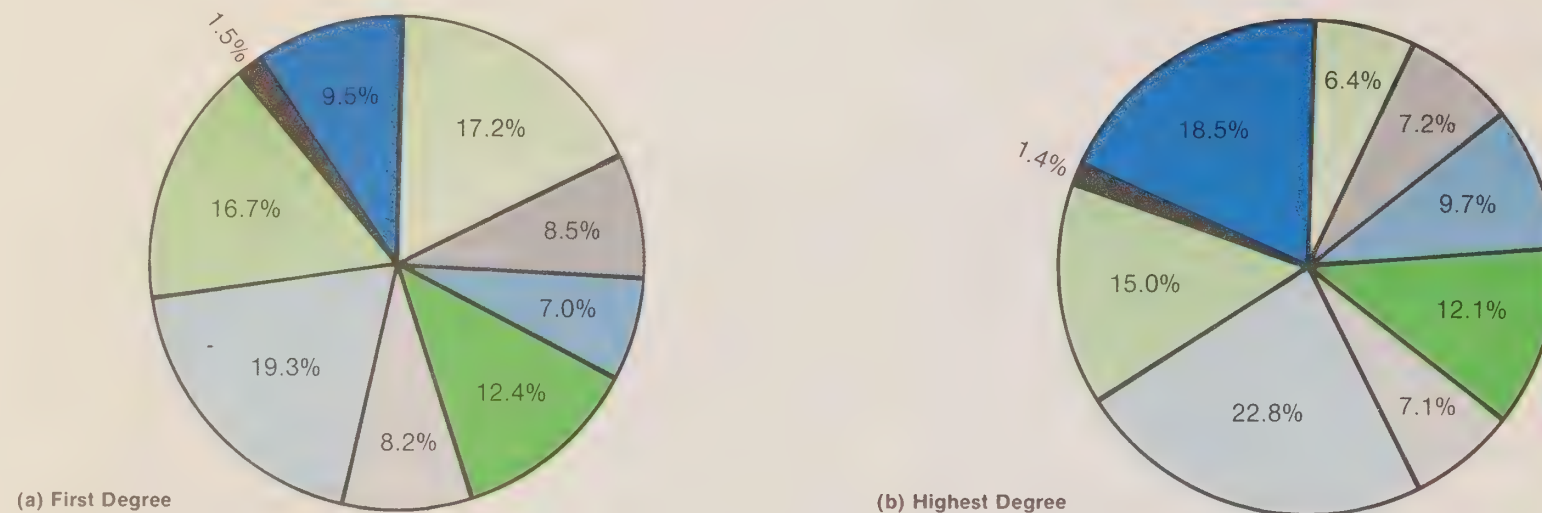
It is interesting to note that nearly 60 per cent of persons whose last degree was in social science had taken their first degree in a different field. This is not surprising since the demand for some social scientists was high in the mid-sixties so that many degree-holders in other fields might have been encouraged to take an additional degree in social science. Moreover, as noted in Chapter VI, a substantial proportion of persons in managerial and administrative occupations had taken their last degree in social science; thus a degree in social science may

also provide additional promotion opportunities to managerial occupations.

Roughly five per cent of degree-holders who worked at some time in the year prior to the survey had a doctorate (including for example Ph.D and D.Sc. but excluding M.D. or D.D.S.) but this proportion varied considerably by major field of study (Figure IV.3). The proportion was relatively high for specialists in mathematics and physical sciences and in agricultural and biological sciences, both of which are highly research-oriented. By contrast it was relatively low in medicine, dentistry and health and in education, both of which are more vocationally oriented. The proportion with a masters degree was also low for medicine, dentistry and health fields but high for the social and human sciences.

These differences in degree type were even more marked across individual occupations (Figure IV.4). Thus the proportion of university teachers with a doctorate was nearly 50 per cent, but only one-tenth of one per cent of architects held a doctorate. Not surprisingly, a doctorate also appears to be important for jobs in the physical and life sciences, which are research-oriented, but not at all for jobs in medicine, dentistry and health and in engineering which are more vocational. Some occupations also had a large proportion of persons with masters degrees but not with doctorates. For example, 44 per cent of social workers had a masters degree, but fewer than 1 per cent had a doctorate: this is probably partly due to the fact that graduates who become social workers can often specialise in this field only at the masters level.

FIGURE IV.1 Distribution by major field of study of first and highest degrees

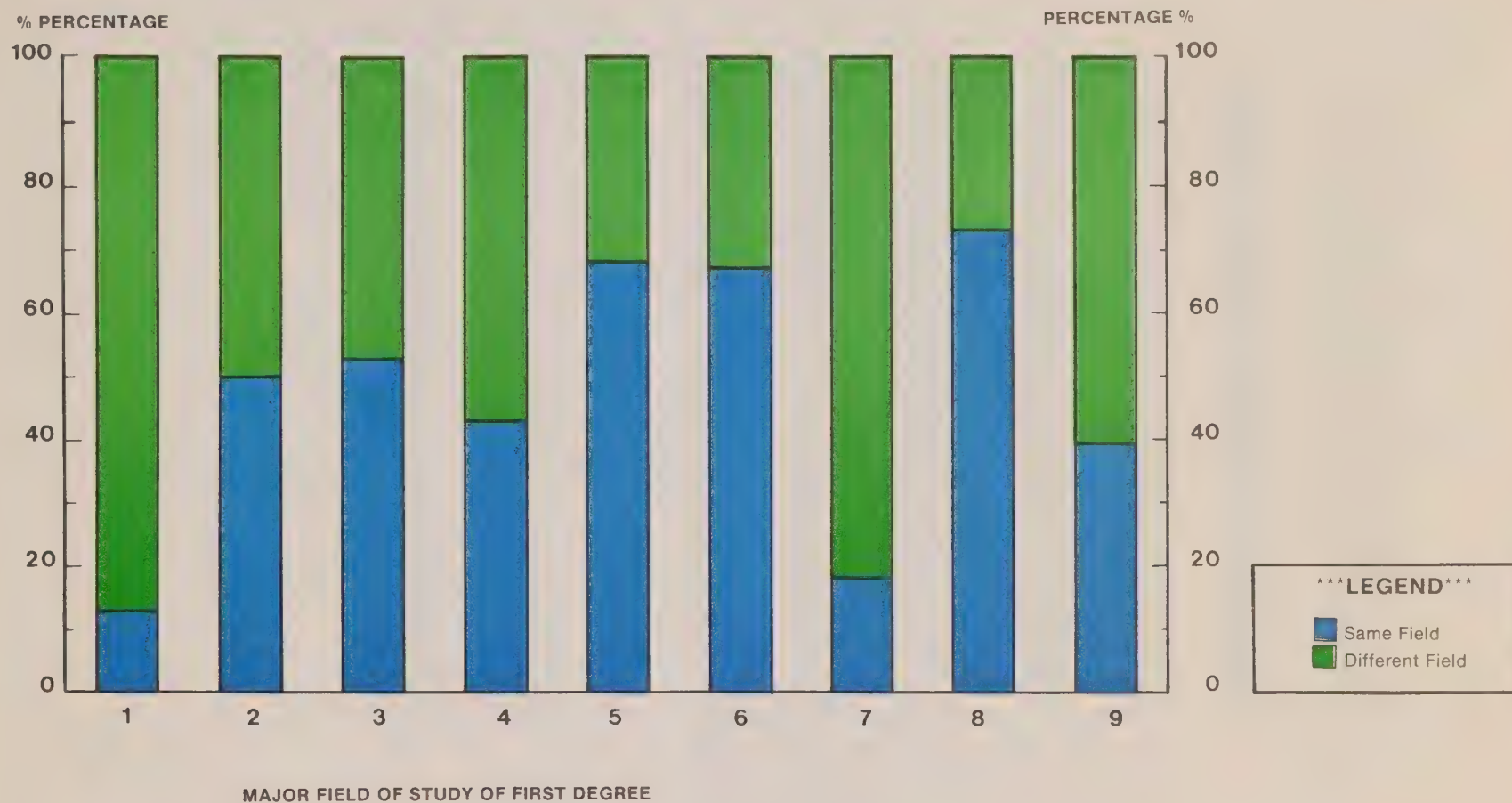


*****LEGEND*****

FIELD OF STUDY

- Education ■
- Fine Arts & Music ■
- Humanities & Related ■
- Social Sciences & Related ■
- Agriculture & Biological Sciences (except Health) ■
- Architecture & Engineering ■
- Medicine, Dentistry, Health ■
- Mathematics & Physical Sciences ■
- General Arts & Science ■

FIGURE IV.2 Proportion of degree-holders with more than one qualification who specialised in the same and different fields for first and highest degrees (aggregated)



- 1 Education
- 2 Fine Arts & Music
- 3 Humanities & Related

- 4 Social Sciences & Related
- 5 Agriculture & Biological Sciences (except Health)
- 6 Architecture & Engineering

- 7 Medicine, Dentistry & Health
- 8 Mathematics & Physical Sciences
- 9 General Arts & Science

FIGURE IV.3 Degree level by major field of study for persons employed at some time in the twelve months prior to the survey

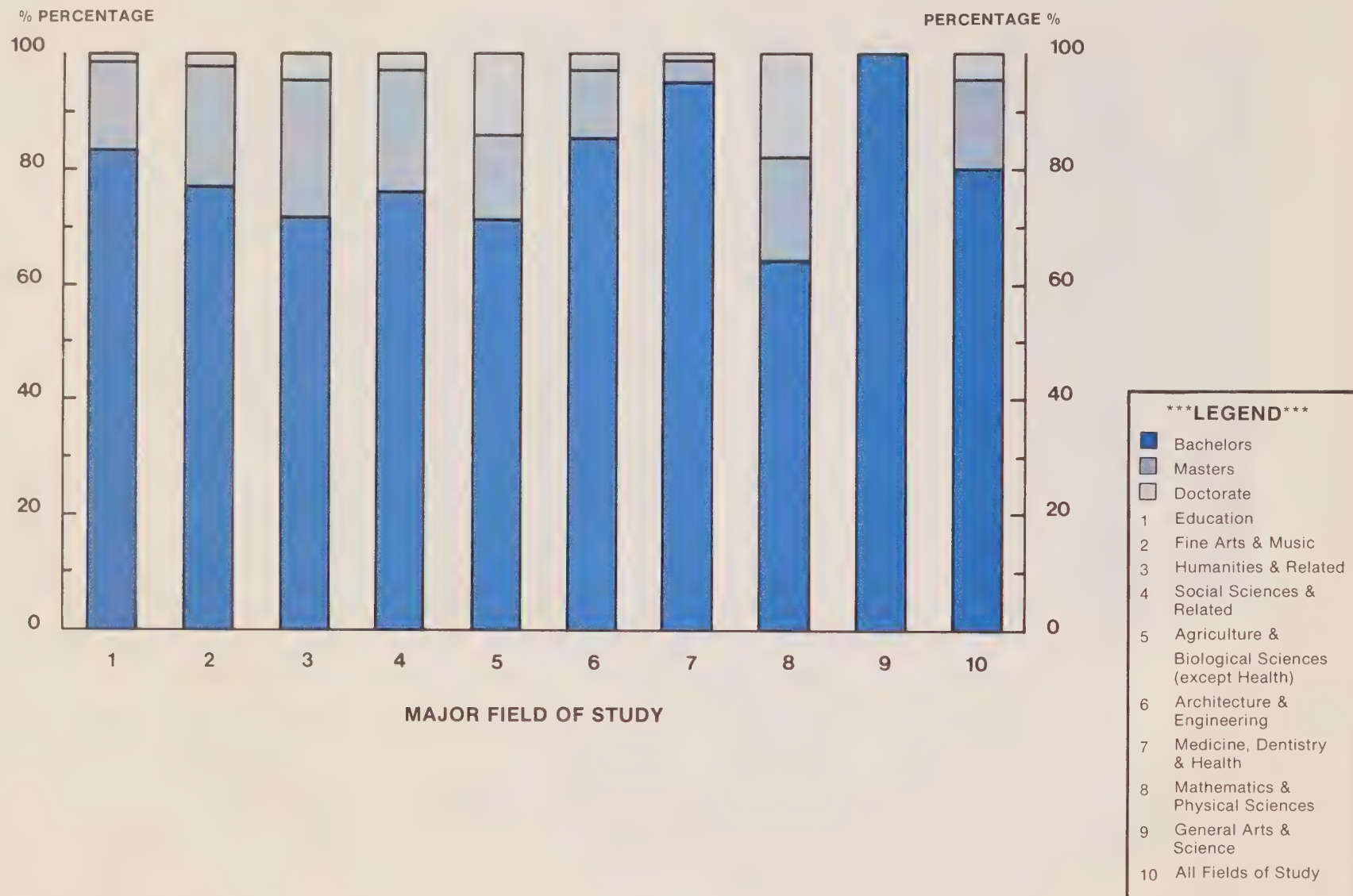
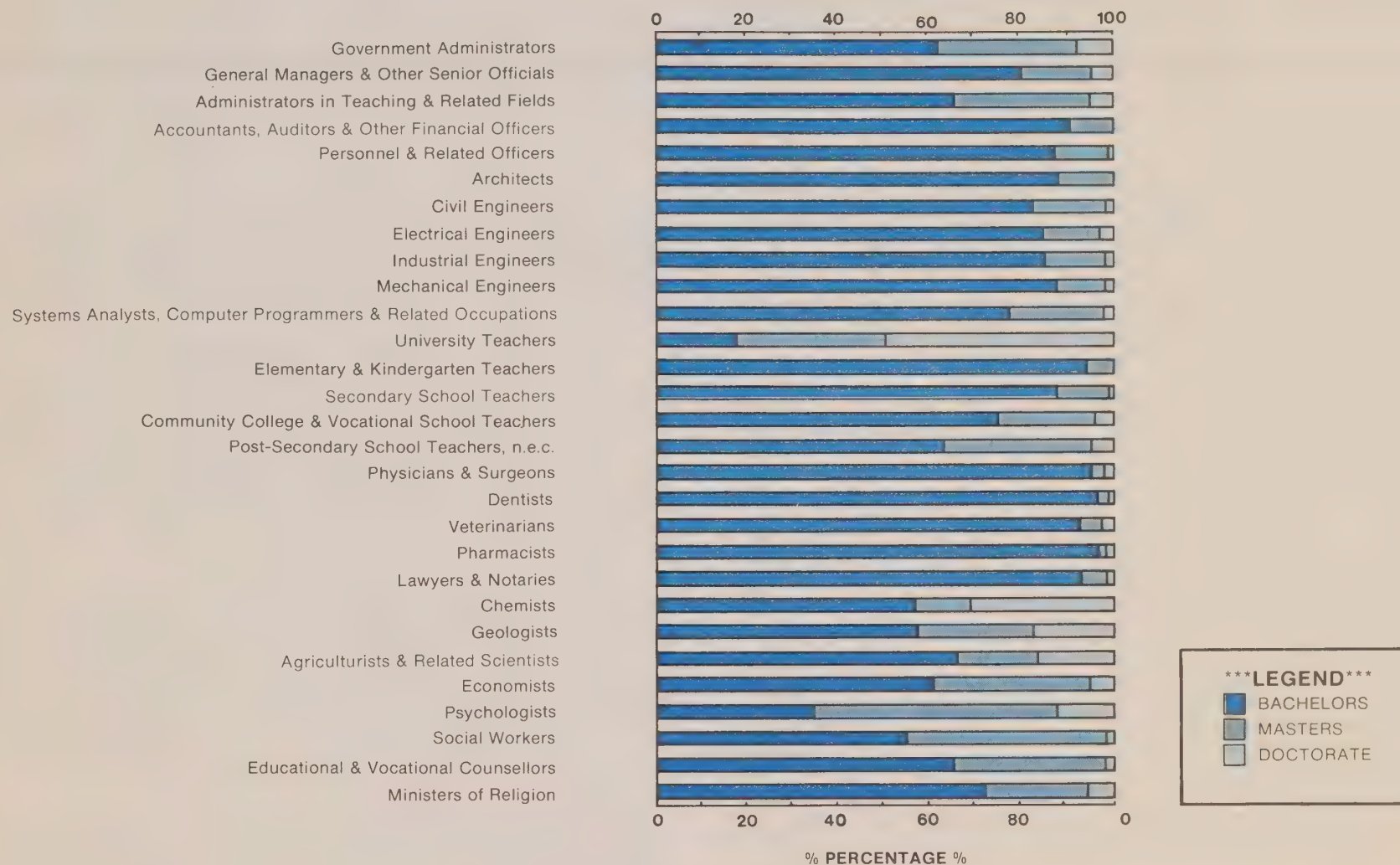


FIGURE IV.4 Degree levels for selected occupations



Chapter V

Age and Years Since Graduation

Introduction

The distributions of degree-holders by age and by years since graduation are examined in this chapter. Since most degree-holders had taken their university education immediately after the completion of secondary schooling, years since graduation and age are closely related. However, it is useful to analyse the distributions separately since they may provide different indicators for policy and planning.

The age distribution of degree-holders in a particular occupation provides a basis for examining the effects of future demographic changes on the occupation. For example, a large proportion of young degree-holders in an occupation may lead to a demographic “lock-up” in which the promotion possibilities in the occupation are severely restricted; as a result, students may react to this information by choosing programs of study which provide employment opportunities in other occupations. Similarly, the existence of a large proportion of older degree-holders in an occupation suggests that the demand generated by retirement and mortality will be high and hence a large number of replacement jobs may become available in the occupation; students may then change their programs of study to take advantage of these additional opportunities.

Because of the wide variation in the age at which degrees are earned, the number of years since graduation provides a better indicator than age of the working experience of degree-holders. Years since graduation also measure the “age” of degrees and hence the distribution can be analysed in much the same way as the age of a population. The distribution of degree-holders by years since graduation is partly determined by university enrolments and hence by the “birth” of new degrees, and by the age at graduation which determines losses through mortality and retirement. Thus, the dramatic increase in university enrolments over the past twenty years would generally have caused a vast increase in the “birth” of new degrees so that the distributions will tend to be highly positively skewed. Examination of the distributions of degree-holders in different fields of study will therefore help to identify those fields which have benefitted most from the recent increase in enrolments and which have the largest proportions of inexperienced degree-holders.

Age distributions of occupations

The age distribution of all degree-holders who reported an occupation is shown in Figure V.1. About 28 per cent of all degree-holders were under 30 years of age and roughly 45 per cent were under 35 years of age. The distribution has a peak for the 25-29 age group and then falls off fairly consistently with age.

The distributions for selected occupations (Figures V.2 to V.4) vary considerably both within and between occupation groups. For example, in the managerial and administrative group, government administrators and general managers tend to be much older than all degree-holders; in the same group, accountants and auditors and personnel and related officers tend to be younger than average. Similarly, in social science occupations, economists and psychologists were younger than average while educational and vocational counsellors and ministers of religion were older than average. University teachers tend to be older than average while elementary and secondary school teachers were younger than average.

The age distributions for health occupations are somewhat different from those for other occupations. For example, for physicians and surgeons the distribution is fairly uniform over the range 30-54 and the peak is much less marked than for other occupations. This probably results from the high immigration of doctors and the low mobility out of the occupation. It is also interesting to note that the proportion of persons in health occupations who were 65 or over was greater than that for all degree-holders, indicating the higher potential for such persons to continue their employment beyond the normal retirement age.

Engineers were also generally older than all degree-holders, and so too were physical scientists. Systems analysts and programmers were, by contrast, much younger than average. This is not surprising, however, since this is a fairly new occupation and the demand over the past decade or so has outstripped the supply.

The data in Figures V.2 to V.4 may be used to provide some important indicators for manpower planning. For example, existing population projections suggest that enrolments in secondary schools will decline over the next several

years (see [33]) and hence the supply of new teaching jobs can be expected to fall. At the same time, because of the existing age distribution of teachers, the number of retirements will be low and so too will be the replacement demand for teachers. Thus the job market for teachers will probably become considerably tighter than it is at present.

The same reasoning may be applied to university teachers (See [26]). A large number of young university teachers were appointed in the university expansion of the sixties and the majority of these are still a long way from retirement. At the same time, the rate of increase of full-time enrolments is declining, and it may even become negative in the eighties, so that the number of new jobs in the occupation will probably fall considerably. Thus the number of opportunities for new entrants to the occupation will probably be severely limited and this may have important repercussions on the expansion of knowledge and the scope of research in Canadian universities.

Another example is the case of physicians and surgeons. Slightly more than 45 per cent of these were aged 45 years or more, so that the replacement demand will probably increase substantially in about 10 years or so. If the current controls on the immigration of doctors should be continued at that time, the demand for Canadian medical graduates will increase substantially and this may necessitate planning for additional training facilities at Canadian universities.

Years since graduation for all degree-holders

The data in Figure V.5 show that more than half of all degree-holders received their highest degree in the 10 years prior to the survey. Only about 10 per cent received their degree 30 or more years before 1973. For most types of degree, and particularly for masters degrees and doctorates, the distribution is highly skewed reflecting the rapid expansion in university education which has taken place in recent years.

The distribution for persons with a first degree in medicine, dentistry or veterinary science is remarkably different from that for other types of degree. The distribution is fairly uniform, and the proportion of this group of degree-holders with different years since graduation is fairly constant. Since the age at which the highest degree was obtained was only slightly higher for this group than for general undergraduate degrees (27.3 years compared to 24.1 years) it is apparent that controls on enrolments in these fields must be largely responsible for the shape of the distribution.

The data for all degree-holders are shown from a different perspective in Figure V.6: in this case, the distribution of degree-holders by type of degree is compared for different years since graduation. The proportion of persons with a first degree in medicine, dentistry or veterinary science falls substantially as the number of years since graduation decreases; thus only 2.7 per cent of degrees obtained in the 5 years to 1973, but 11.1 per cent of those obtained 30 years or more before that time, were in this group. This again shows that enrolments in this group rose only slightly while total enrolments increased dramatically.

For the other types of degree, the pattern of change is less striking. There appears to have been a slight decline in both general and specialised undergraduate degrees, and an increase in masters and doctorate degrees. In the case of masters degrees, however, part of the increase is artificial since some of the persons in the latter category would probably have been taking doctorate degrees.

The distribution of years since graduation is shown for selected detailed major fields of study in Figures V.7 to V.9. For education fields of study, the distributions are all highly skewed, particularly for specialists in secondary schooling and in elementary, kindergarten and pre-school education: more than 40 per cent of degrees in these fields were awarded in the five years before 1973. This is probably a result of the increased demand for degrees in education generated in recent years by changes in the qualifications required for school teaching.

Degrees in the humanities and related fields were also generally “younger” than average. Religious studies are an exception, however, and the distribution is less skewed than that for all degrees. Thus degrees in this field of study were “older” than average.

For social science fields, the distributions also varied considerably by specialisation, and they are highly skewed in some fields: for example, more than half of the degrees in sociology and psychology had been awarded in the five years before 1973. One possible explanation is that the greater social awareness which emerged in the nineteen-sixties helped to encourage the expansion of programs of study in the social sciences as well as the number of students wishing to take these fields. The increased participation of women in university education and the popularity of these fields as an area of study for female students also help to explain the shape of the distributions.

The distribution of years since graduation is very different for fields in engineering, health and the physical sciences. The distribution in each case is much less skewed than those for fields in education, the humanities and social science. There is also some irregularity in almost all of these distributions: for example, in engineering fields the proportion rises, then falls, then rises again before finally falling, as the number of years since graduation increases. This pattern is consistent with the “cobweb” model which postulates that the supply of engineers follows a cyclical pattern as students react to market forces (See [15]). Similarly the distribution for medical degrees is remarkably uniform though there is a slight peak at 10-14 years since graduation. Since a large proportion of doctors are immigrants, the shape of the distribution may be due to changing patterns of immigration over the years. Finally the distributions for degree-holders in physics and in chemistry are highly skewed, suggesting that these fields benefitted from the recent expansion in university education.

The wide differences in the distributions for some fields in the social sciences, education and the humanities compared to those for some fields in the natural sciences may have important implications for manpower policy. For example, as will be seen in Chapter VI, a large proportion of graduates in the social and

human sciences were employed in teaching occupations. Since the number of teaching jobs will probably increase at a much lower rate over the next few years than in the recent past, it seems likely that many recent graduates in these fields may have to seek employment or promotion outside the preferred occupations. This will probably result in a greater proportion having to work in the more “general” occupations, such as administration or management, and in occupations which do not normally require a degree, such as clerical and sales occupations. In addition, since current unemployment rates are particularly high for younger persons with less experience, it would not be surprising if degree-holders in the social and human sciences were subject to higher unemployment rates than those in other fields.

Some of the other implications of these distributions need to be explored in detail. For example, the relatively greater supply of graduates in the social and human sciences now as compared to twenty years ago, may have important effects on the methods of selection used by employers in hiring such graduates for jobs and hence on their earnings throughout their working lives. Similarly the large proportion of women graduates in these fields of study may generate significant changes in their participation in the labour force and in their family life.

Years since graduation for doctorate-holders

The distribution of years since graduation for doctorate-holders who worked in a full-time job for 40 or more weeks also varies considerably by field of study (see Figure V.10). It tends to be more highly skewed for fields in the humanities and in the social sciences than for those in the natural sciences: this indicates that a higher proportion of doctorate-holders in the former fields received their degree in the five years before 1973. For example, 41 per cent of the doctorates in history, but 19 per cent of those in physics, were awarded in the five years before 1973.

Although not all doctorate-holders are involved in research and development, the number of doctorates in a particular field provides a very rough indicator of the “research capital” available in that field. The distribution of doctorates by years since graduation reflects the “age” of this “research capital” and hence its productive potential. Persons who have only recently obtained their doctorate will generally have more working years left before death or retirement than those who received their doctorate many years ago; thus the productive potential, measured in working years, of a “young” doctorate will generally be higher than that of an “older” doctorate. The predominance of “young” degrees in some fields suggests that the productive potential of the particular type of “research capital” will be high, and total research output in these fields may increase substantially as these degree-holders develop more working experience.

The large proportion of “older” doctorates in some fields of study may also cause some concern about the future research potential in those fields. For example, slightly more than one-fifth of all the doctorate-holders in geology and related earth sciences obtained their degree before 1953. Many of these will now be nearing retirement so that maintaining the strength of doctorates in this field may have some implications for the training of new doctorates. Analysis of this

issue may be particularly important since the data show that the proportion of graduating doctorate-holders in this field fell considerably over the period to 1973.

The distribution of years since graduation also has important implications for the job market for doctorates. Thus a highly positively skewed distribution suggests that unless the supply of jobs preferred by doctorate-holders increases, the competition for available jobs will increase and the relative incomes of this group may fall. For example, a substantial proportion is employed as university teachers so that if university teaching jobs do not increase as they have in the recent past, the job market for doctorate-holders will tend to tighten. The effects of this tightening will be particularly harsh in fields with a high proportion of “young” doctorates, such as the humanities and social sciences.

Conclusions

The distributions of degree-holders by age and by years since graduation were examined in this chapter. It was found that the age distributions of persons in different occupations varied substantially. Degree-holders in occupations such as economics, teaching and systems analysis and programming were younger than all degree-holders taken together; by contrast those in occupations such as engineering and health diagnosing occupations were older than all degree-holders taken together.

The distributions of degree-holders by years since graduation showed substantial differences by major field of study. A considerable proportion of graduates in fields such as education and social science received their highest degree in the ten years prior to the survey. In other fields, such as health and engineering, the distributions were less skewed in that a substantial proportion had received their highest degree more than ten years prior to the survey.

Some of these findings may have important implications on the supply of jobs for graduates. For example, the age distribution for teachers suggests that the number of retirements will be low over the next few years, so that the replacement demand for teachers will also be low. Similarly, many recent graduates in fields such as the social sciences and the humanities may face increasing difficulty in finding jobs in their preferred occupations, such as managerial and administrative occupations, because of the relatively high supply of many young graduates in these fields.

FIGURE V.1 Age distribution of all degree-holders reporting an occupation

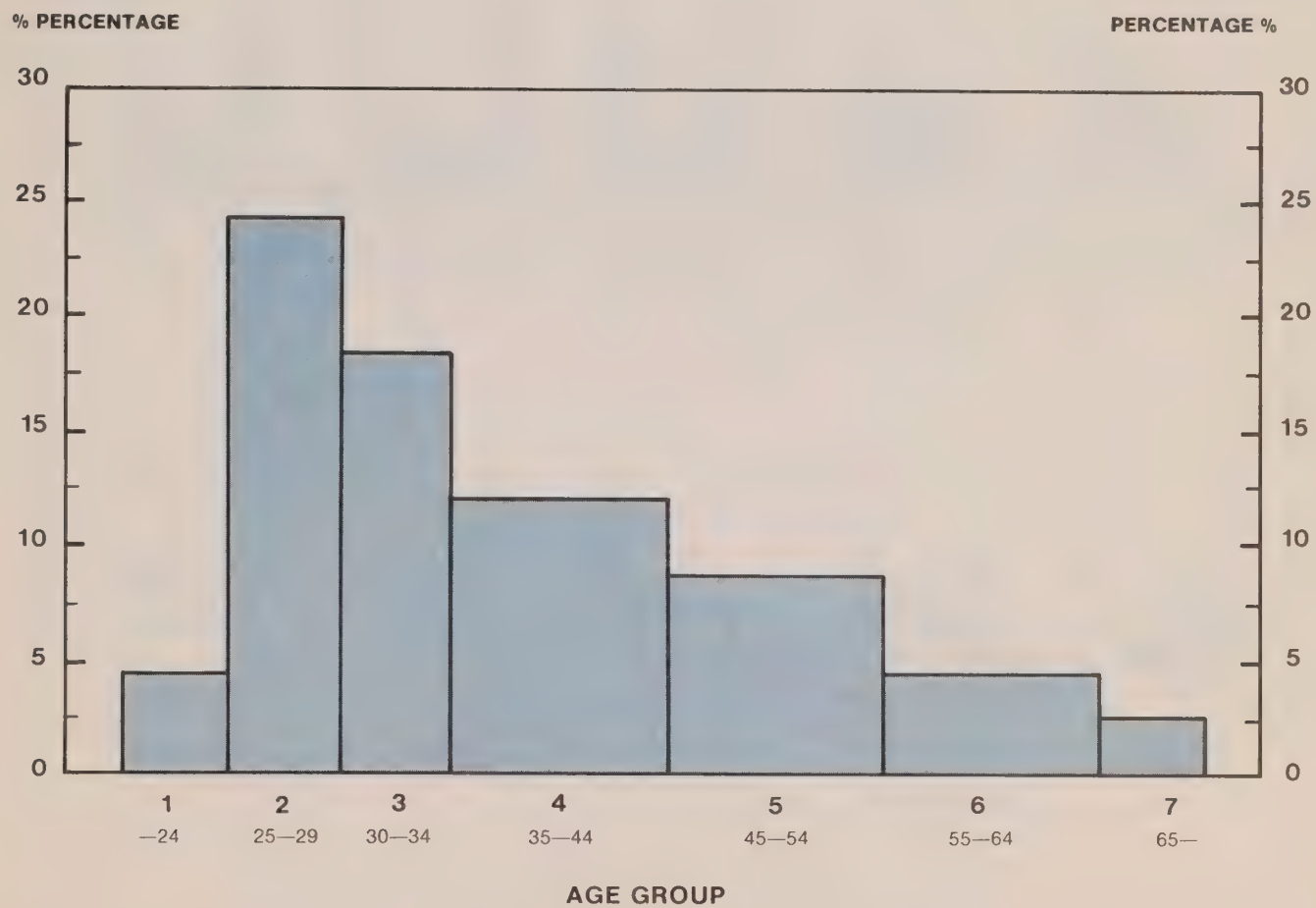


FIGURE V.2 Age distribution for selected occupations: managerial & administrative and social science occupations

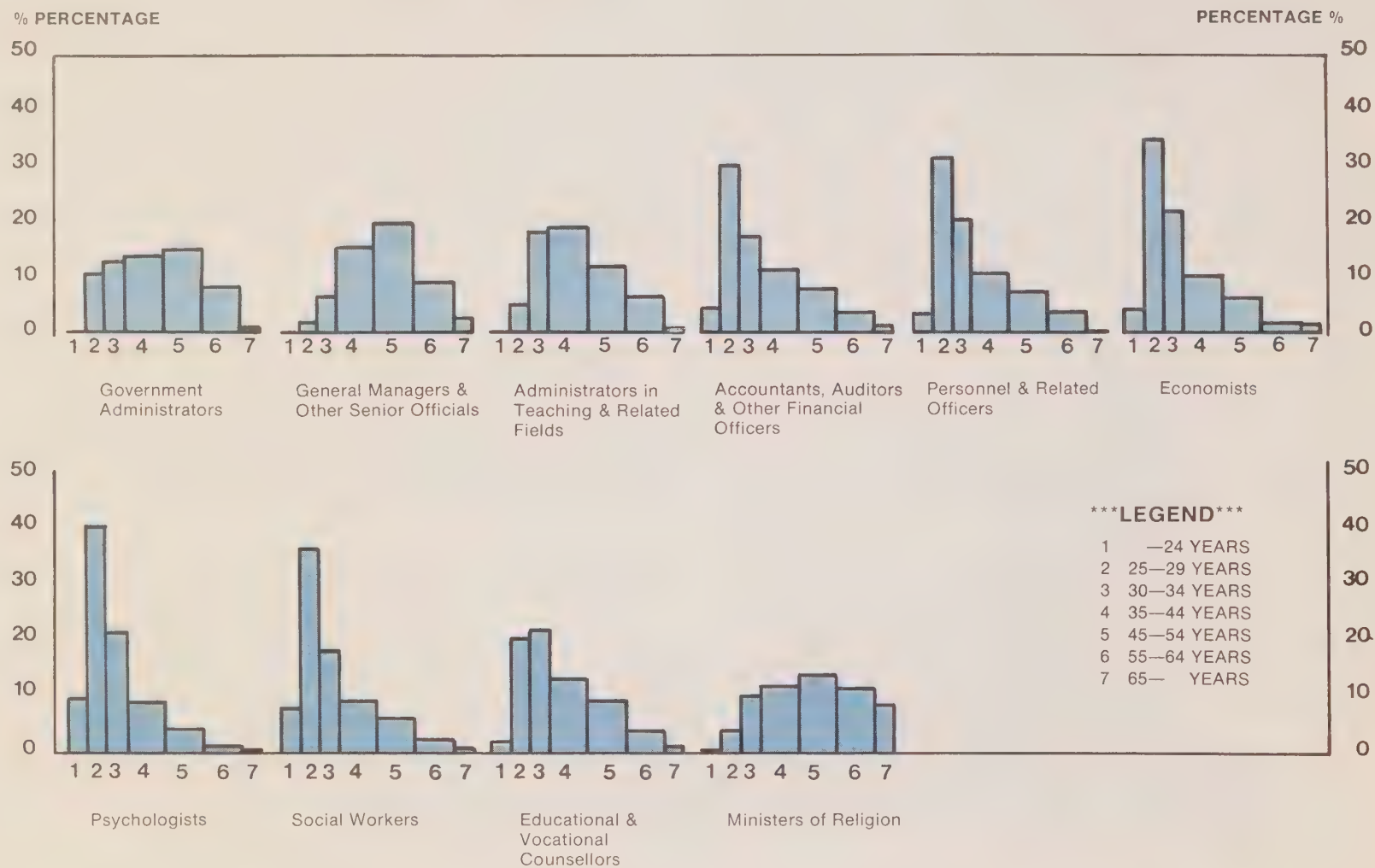


FIGURE V.3 Age distribution for selected occupations: teaching, health & law occupations

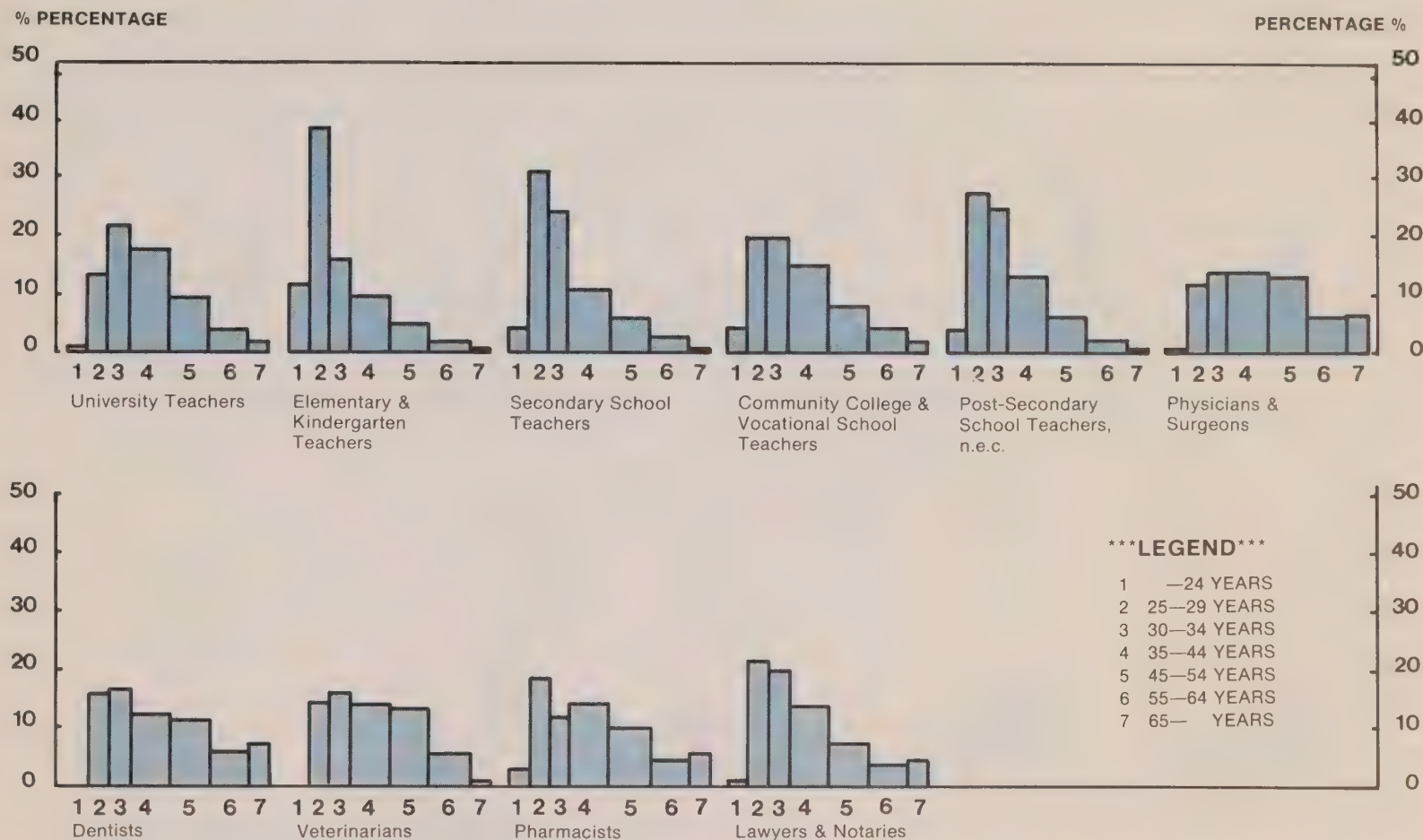


FIGURE V.4 Age distribution for selected occupations: engineering and natural science occupations

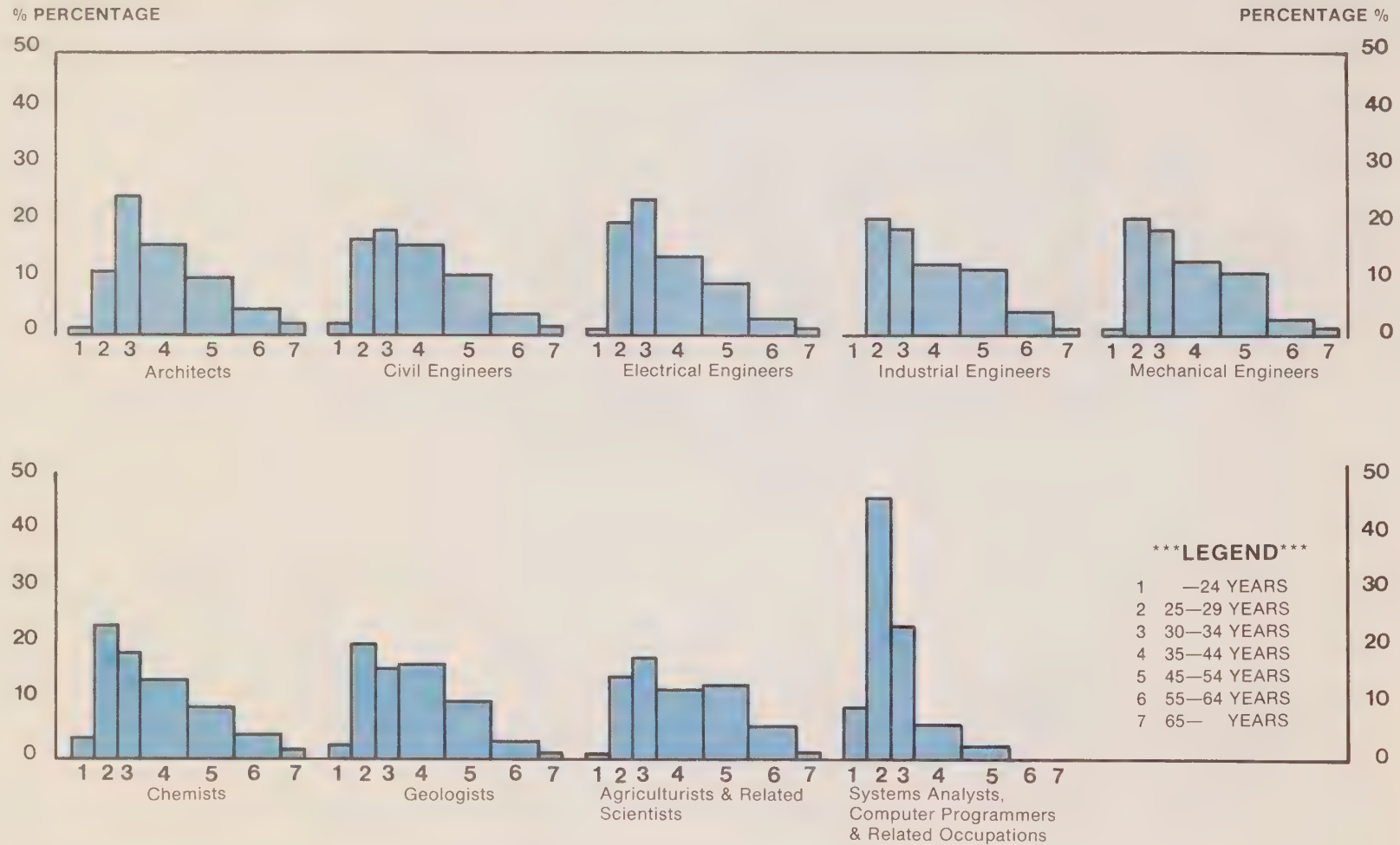


FIGURE V.5 Distribution of years since graduation by type of degree

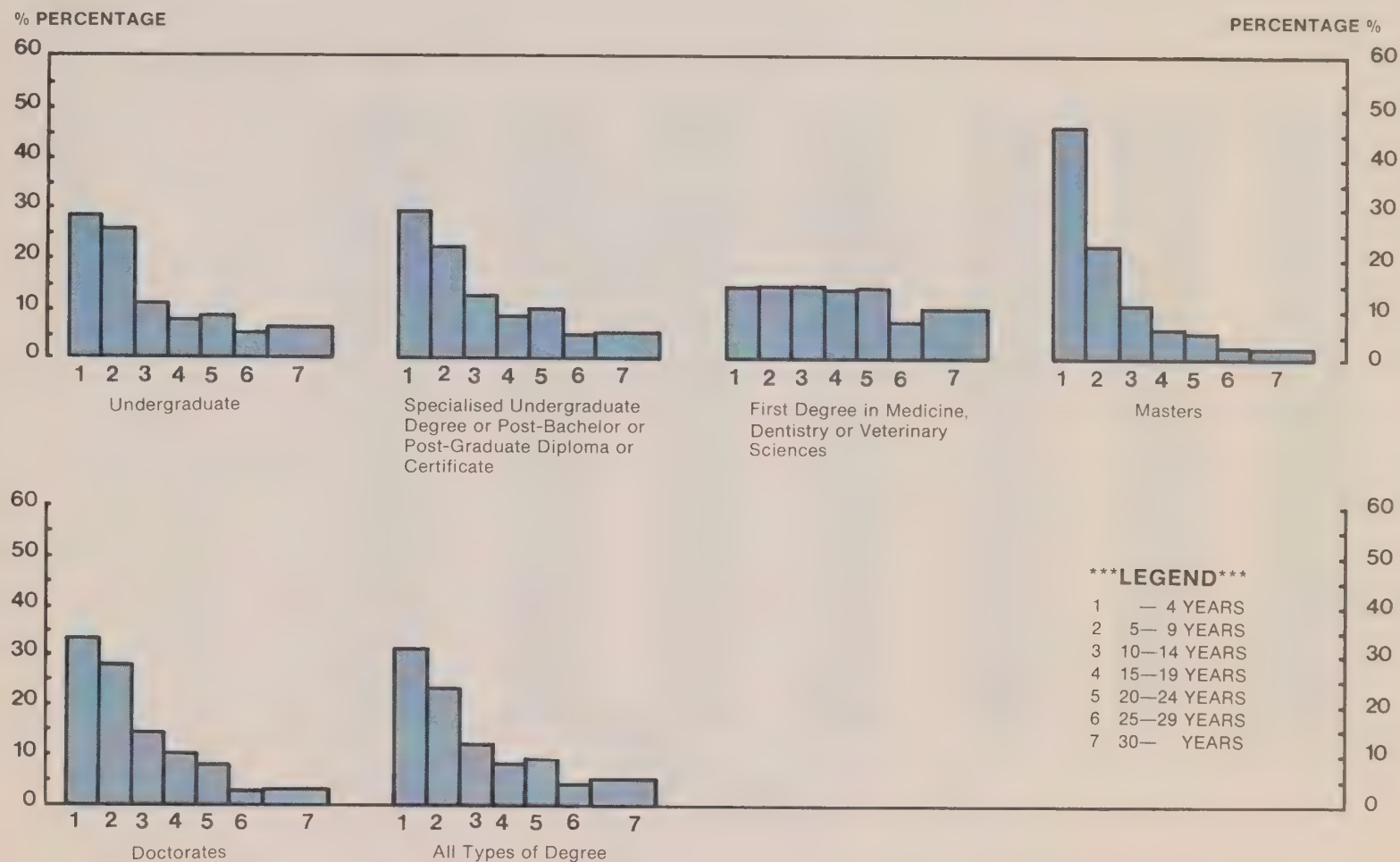


FIGURE V.6 Distribution by type of degree for different years since graduation

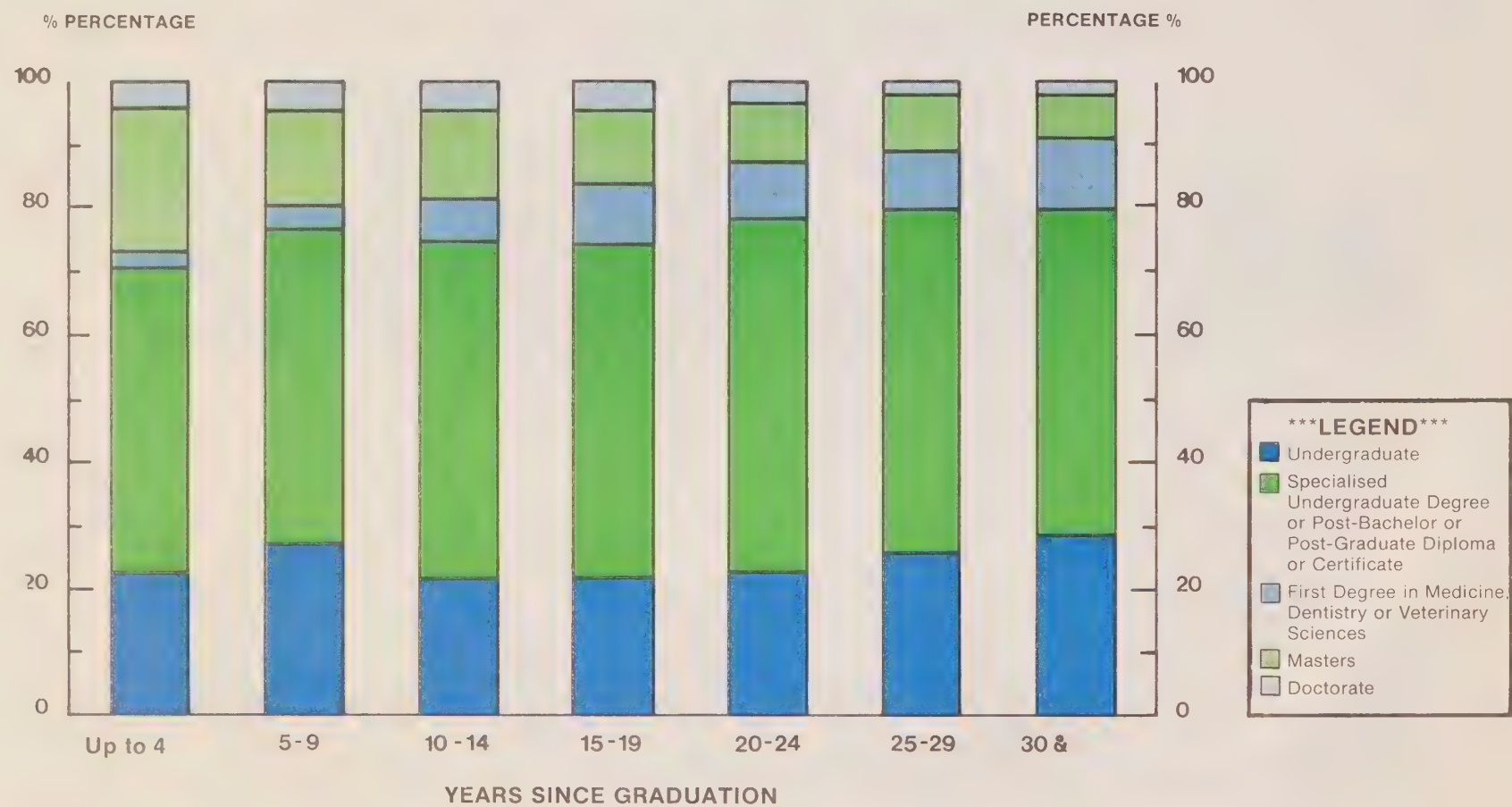


FIGURE V.7 Distribution of years since graduation for selected major fields of study: education and humanities

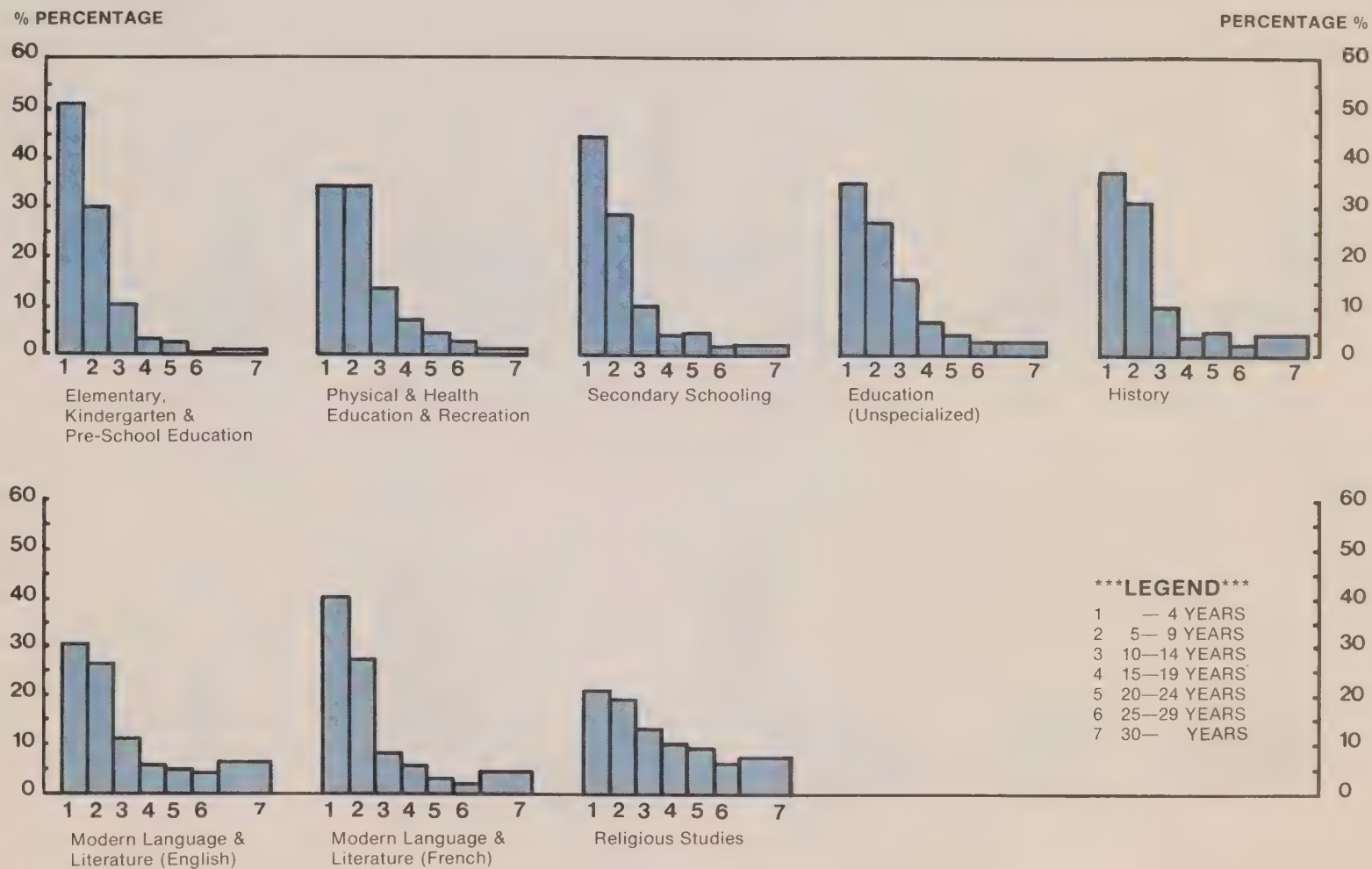


FIGURE V.8 Distribution of years since graduation for selected major fields of study: social science and engineering

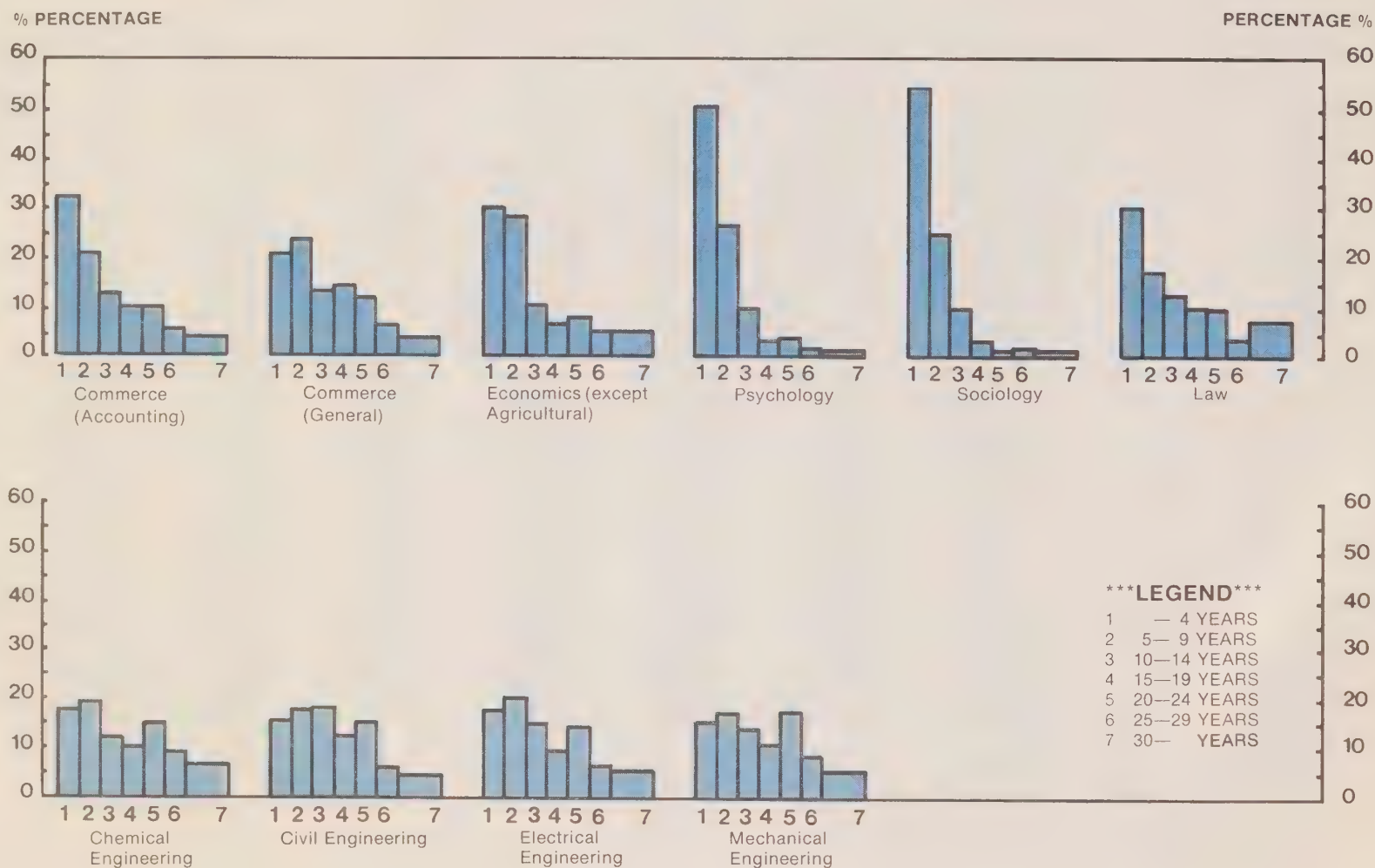


FIGURE V.9 Distribution of years since graduation for selected major fields of study: health and physical sciences

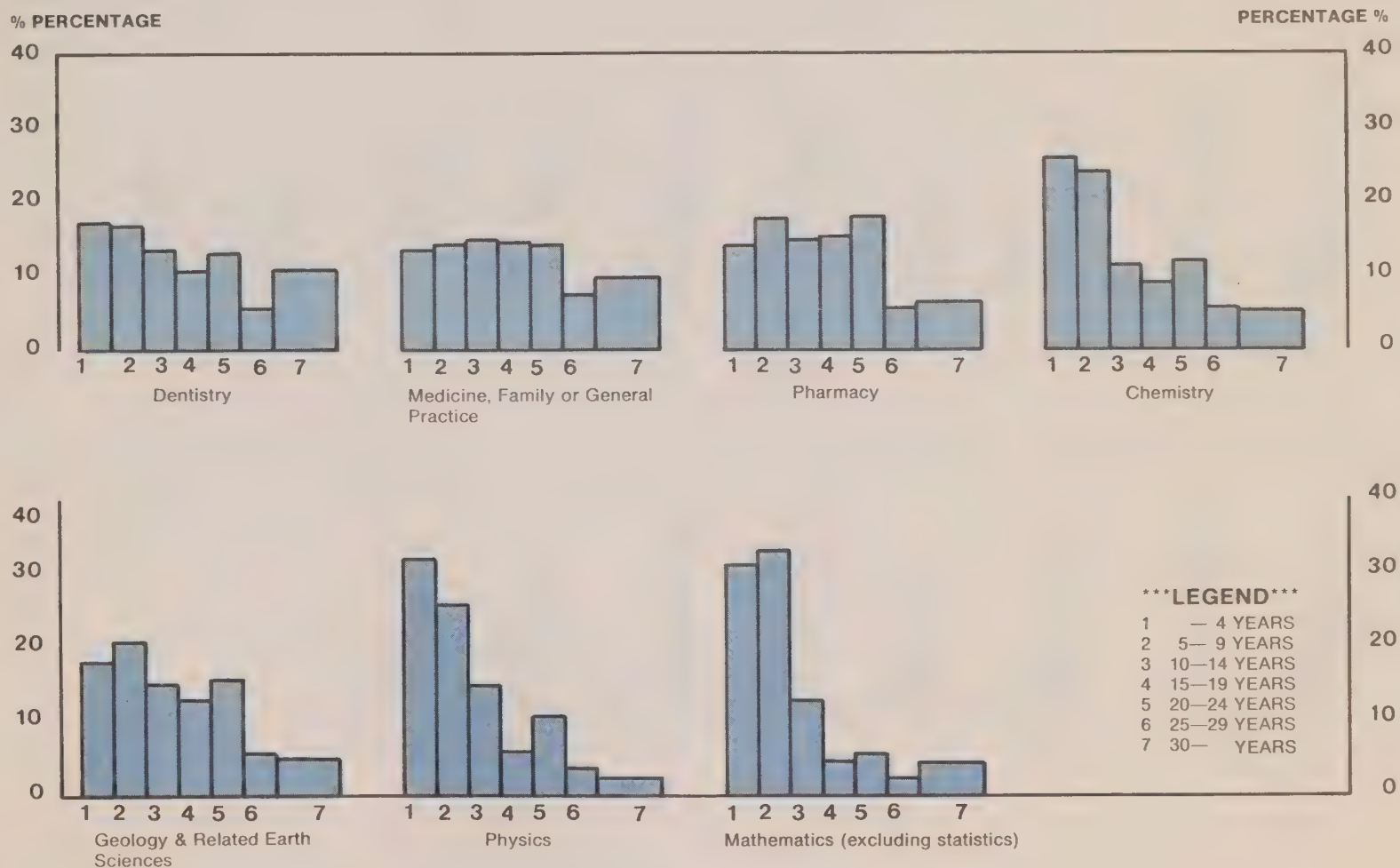
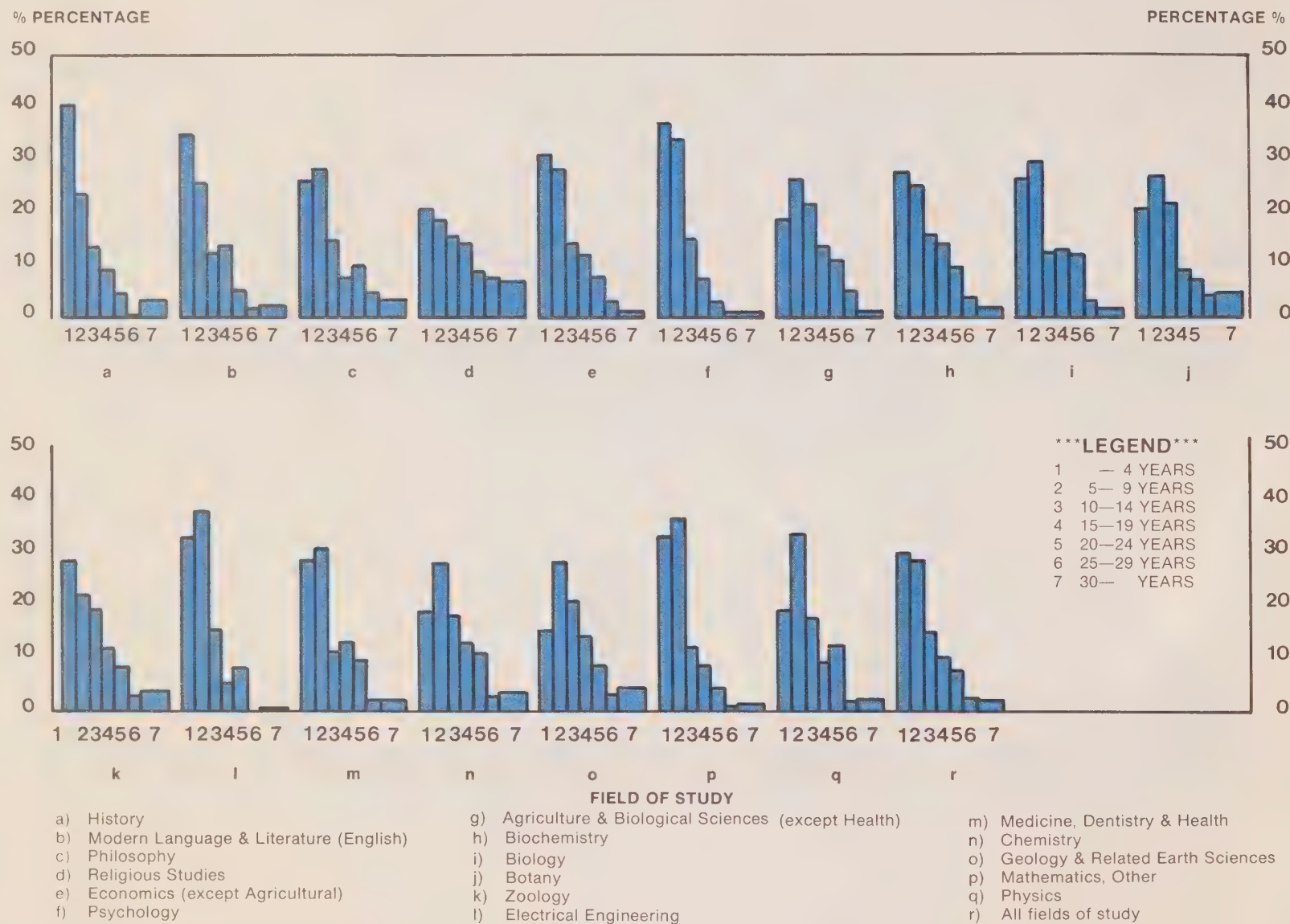


FIGURE V.10 Distribution of years since graduation for doctorate-holders (who worked 40 or more weeks full-time) in selected fields of study



Chapter VI

Occupation and Major Field of Study

Introduction

The occupations and fields of study of degree-holders are examined in this chapter with the aim of identifying the linkages between their educational qualifications and their jobs. The aim is to provide some insight into the workings of the labour market for degree-holders.

The data are examined from two perspectives. The first deals with the fields of study taken by persons in a given occupation. The analysis in this case may be framed in terms of this question: were the degree-holders employed in a given occupation drawn mainly from one field or from a variety of fields? Some occupations (such as medicine and surgery) are only open to persons with a specific educational qualification, while others (such as government administration) are open to persons with a variety of educational qualifications. Thus, this type of analysis helps to identify the extent to which occupations are education-specific, and hence the extent to which a change in the employment prospects in different occupations may have implications for the outputs of the university system.

From a second perspective, the data may be used to identify the occupations in which degree-holders in a given field were employed. In this case, the appropriate question is this: did degree-holders with a given field of study find jobs mainly in one occupation or in a variety of occupations? This type of analysis helps to determine the extent to which the skills developed in a particular field of study are usable in a range of occupations. It also helps to provide students in different fields of study with an indicator of the career opportunities which may be open to them.

As noted in Chapter I, no data were collected in the survey on the extent to which degree-holders use their qualifications in the performance of their job functions. As a result, it is not possible to properly examine the question of the utilisation of degree-holders. However, the proportion of degree-holders in occupations which do not normally require a degree may provide a very rough indicator of the effective utilisation of degree-holders. This is explored in the last section of the chapter.

Major fields of study of degree-holders in given occupations

This section deals with the fields of study taken by degree-holders in a given occupation. As noted above, such analysis helps to identify the extent to which a given occupation is education-specific in the sense that employment in that occupation depends on the possession of a particular educational qualification.

The extent to which an occupation is education-specific depends on a number of factors. Employment in some occupations is often restricted to persons with particular educational qualifications because of a requirement by law or by a professional association or union. In other cases, employers may recognize that the skills developed in a specific field of study are particularly suited to the functions of a given occupation, and they may therefore restrict employment to persons with those qualifications. More generally however, employers may prefer to employ persons with a specific educational qualification in a given occupation, but the choice of the actual person they employ may depend on the personal characteristics and background of the person concerned, and on the availability and wages of persons both with the specific and with related qualifications. In formal economic terms, the educational qualifications held by persons in various occupations are therefore determined partly through the workings of the labour market and partly through imperfections which limit the operation of the labour market.

The identification of occupations which are highly education-specific may be extremely useful for planning the outputs of the university sector. If employment in these occupations were expected to change, then it would make sense to consider altering university enrolments in the related fields of study in order to accommodate these changes. Of course, other factors, such as current imbalances in the occupation and the non-economic benefits of various types of education, must also be considered.

Planning for expected changes in employment in occupations which are less education-specific is much more difficult. Since degree-holders from a variety of fields may be employed in such occupations, expected changes in employment can be accommodated by altering university enrolments in a number of fields of

study; there may therefore be no simple way of choosing specific fields of study in which changes in enrolments should be considered.

Although this weakness in the education-occupation link has been explicitly recognized in the literature on manpower planning, its effects are often assumed to be negligible. One possible explanation for this is that detailed data on the occupations and fields of study of degree-holders have not often been available, and researchers have generally had to make do with highly aggregated data on occupation and education. For example, the available data on educational attainment have most often been classified by number of years or by level of schooling so that all degree-holders have generally been treated as a single group. (See for example [2]). Analysis of such highly aggregated data may create the false impression that most university graduates are in highly education-specific occupations, and that this information may provide a reasonable basis for planning the outputs of graduates.

The potential for misinterpretation of aggregated data may be better understood by consideration of the data in Figure VI.1. The chart, which is based on 1971 census data, shows the proportion that degree-holders formed of the labour force in each of thirty selected occupations. The occupational classification used is based on the detailed classification of 115 categories given in Appendix II. The occupations shown cover 55 per cent of all degree-holders in 1971, and were chosen in order to provide a fairly broad and varied range of the occupations of degree-holders. Two main selection criteria were used: (a) the absolute number and (b) the relative importance of degree-holders in the given occupation. For example, only 18 per cent of the elementary school teachers in 1971 had a university degree, but there were 27,000 such teachers in the labour force. By contrast, there were only 1600 veterinarians with a degree in 1971, but they formed 96 per cent of the total labour force in that occupation. Both of these occupations were included in the analysis since they represent different extremes.

As might be expected, the proportion that degree-holders formed of the labour force varied considerably by occupation. For some occupations, such as dentistry, university teaching and medicine and surgery, for which a university degree is a requirement, the proportion was close to 100 per cent. (The difference from 100 per cent may be explained by a number of factors including errors in response and students performing the functions of a particular occupation at the time of the census.) For other occupations, such as government administration or elementary school teaching, the proportion of degree-holders was fairly small.

In 21 of the 30 occupations shown, the proportion of degree-holders was at least 50 per cent so that it is easy to conclude that the majority of occupations are highly education-specific. In addition, since a university degree is becoming a requirement for employment in an increasing number of occupations (elementary school teaching is such an example), it may be argued that the proportion will be even higher in the future. Thus, it may seem reasonable to conclude that the data provide a satisfactory basis for transforming the projected employment in various occupations into the numbers of degree-holders required at some future date.

One major problem with this approach is that it does not directly take into account the fields of study of degree-holders in a particular occupation. As a result, the knowledge that employment opportunities for degree-holders are expanding because of an increasing number of jobs in a given occupation is not directly useful for planning purposes unless degree-holders in that occupation require training in a specific field of study. For example, a projected increase in the demand for physicians and surgeons may be accommodated by increasing the enrolments of medical students; but an increased demand for government administrators may be accommodated by expansion in any of the number of fields of study associated with this occupation.

The charts which follow in this section are designed to show the relative importance of detailed major fields of study in the selected occupations shown in Figure VI.1. Since the purpose of these charts is to show the extent to which occupations are education-specific, only those fields with a fairly large proportion of persons in a given occupation are included in a chart. In particular, a field is shown only if at least 10 per cent of the persons in the given occupation specialised in it. The only exception is when there is no field with at least 10 per cent of persons in the occupation: in such a case only the largest field is shown. The category "field of study not specified" thus groups together all other fields of study; it will be clear that this includes all fields in which fewer than 10 per cent of persons in the occupation specialised.

For individual occupations in the managerial and administrative group of occupations (Figure VI.2), the extent of specialisation appears to be very limited. For example, for government administrators, the largest proportion (10 per cent) had majored in commerce (general). One exception is the case of accountants and auditors: roughly two-thirds of the persons in this occupation had specialised in commerce (general) or in commerce (accounting). Commerce (general) was the single most important field in four of the occupations shown, suggesting that employers show some preference for commerce (general) graduates for some occupations in the managerial and administrative category. Thus seven per cent of the persons in all occupations had specialised in commerce (general), and this figure is smaller than the proportions in some managerial occupations.

It is also interesting to examine the distribution of persons in a given occupation using a more aggregated classification of field of study. If employers prefer to hire specialists in a particular subject to work in a given occupation, persons who had some exposure to that subject but majored in a different field may also be affected by these preferences. A more aggregated classification which groups together closely related fields of study would tend to capture some of these effects since students majoring in a particular field are more likely to have followed courses in related subjects. For example, students who majored in commerce would also often have taken courses in economics and vice versa.

The extent of specialisation is much higher for the aggregated classification of fields of study (Figure VI.3). For example, 44 per cent of government administrators and 54 per cent of personnel and related officers had specialized in the social sciences. For general managers the main major fields of study were the social sciences and engineering and applied science, while most accountants

and auditors had specialized in the social sciences. As would be expected, a large proportion of administrators in teaching had taken degrees in education.

For architects and engineers (Figure VI.4) the data show that specialization by field of study exists for detailed occupations. Roughly four-fifths of the architects, civil engineers, electrical engineers and mechanical engineers had specialized in the corresponding field. By definition, industrial engineers are an exception and the most important fields were engineering and commerce (general); this clearly relates to the wide variety of functions included in the definition of this occupation.

There is also a high degree of specialisation for detailed occupations in the social sciences and religion (Figure VI.5). For example, economists had specialized mainly in commerce (general) and economics, psychologists in psychology and social workers in social work. The extent of specialisation also increases for the more aggregated classification. Thus, for example, 81 per cent of economists and 73 per cent of social workers had majored in the social sciences.

As might be expected, teachers tend to be drawn from a variety of specialities. This is particularly true for university teachers, who are not shown in Figure VI.6 since the largest field included only six per cent of them: this field was modern language and literature (English). For elementary and secondary school teachers, there was some specialization in the corresponding fields and this becomes more marked at the aggregate classification level. Thus more than half of the elementary school and secondary school teachers had specialised in education (Figure VI.7). For university teachers at the aggregate level the most important fields were the humanities, social sciences and mathematics and physical sciences.

Employment in occupations such as medicine and surgery, and the legal profession, is strictly regulated by law or by membership in the various associations so that these are obviously education-specific (Figure VI.8). The vast majority of persons in these occupations had taken their last degrees in the corresponding fields.

The fields of study associated with occupations in the natural sciences and mathematics are shown in Figure VI.9. Here again there is clearly some specialization in one or more fields. For example, most agriculturists had specialised in agriculture or forestry. Systems analysts and computer programmers appear to be somewhat of an exception since only slightly over one-third had majored in computer science or mathematics. However, this is not surprising in view of the extraordinary growth of computing facilities over the past decade: because of the high excess demand for programmers and analysts, persons in fields which provided some exposure to programming techniques would have found jobs in these occupations.

To sum up, the data suggest that there is wide variation in the extent to which occupations are education-specific. Some are highly education-specific so that anticipated changes in employment in these may be accommodated by changes in enrolments in the corresponding fields of study. However, most occupations do

not appear to be highly education-specific so that anticipated changes in employment in these may be accommodated by changes in a variety of fields. The evidence here thus raises questions about the validity of the manpower planning approach to education planning at the university level.

Occupational employment for particular fields of study

In the preceding section, data on occupations and fields of study were examined to shed some light on the extent to which persons in given occupations had specialised in particular fields of study. In this section the same data are looked at from a different perspective. Here the question being asked is: did persons with a particular specialisation find employment in a specific occupation? The analysis focuses on the proportion of persons with a particular specialisation who were employed in various occupations.

The occupations in which degree-holders are employed are determined by a number of factors. Graduates in different fields of study acquire different skills in the educational system, and hence different employment opportunities are open to them. At the same time, it seems reasonable to assume that degree-holders in different fields have different job preferences, which are determined by such factors as their personal aptitudes and by the relative wages in the various occupations, so that they will tend to choose jobs in different occupations.

Although the occupational distribution of graduates in a particular field of study is determined in a complicated way, it may provide useful information for planning and policy. For example, if an occupation is highly education-specific and at the same time most graduates in the specific field were employed in that occupation, it would be fairly simple to determine the changes in enrolments which would be necessary to satisfy anticipated changes in employment in that occupation. Physicians and surgeons provide an example since a degree in medicine is necessary for employment in the occupation, and most graduates in medicine are employed as physicians and surgeons.

Planning is much more difficult if graduates in a specific field of study are employed in a wide range of occupations. As before, if employment in an occupation which is highly education-specific were expected to change, this could be accommodated by a change in enrolments in the specific field of study. In this case, however, the change in enrolments in the specific field would generate changes in employment not only in the given occupation, but in other occupations as well. Thus, there would be no simple way of estimating the change in enrolments necessary to bring about the required change in employment in the given occupation. Electrical engineers provide an example of this type. As noted in the preceding section, most degree-holders in this occupation had taken their highest degree in electrical engineering, but more than half of the graduates in this field were not employed as electrical engineers (see Figure VI.14).

In the analysis which follows, data are presented on the occupational distribution for a number of major fields of study. Fields of study were selected for presentation primarily on the basis of the numbers reporting the particular field for their highest degree. The selected fields cover 350 thousand persons or 64 per

cent of the estimated total number who worked in the year prior to the survey. Persons who had specialised in health fields are excluded from the analysis since the vast majority of these worked in health occupations. For example 92 per cent of those who majored in family or general practice medicine worked as physicians; 82 per cent of those who specialised in pharmacy worked as pharmacists.

Figures VI.10 through VI.16 show the proportion of persons with particular specialisations who were employed in selected occupations. An occupation was chosen for inclusion in a chart only if 10 per cent or more of the persons who had specialised in the given field of study were employed in that occupation. Thus the exclusion of a particular occupation means that less than 10 per cent of the persons with the given field of study were employed in that occupation.

Persons whose highest degree was in one of the selected education fields (Figure VI. 10) were employed mainly in specific teaching occupations. This is not surprising since it is often the case that a diploma or certificate in education is a requirement for teachers. Nearly half of those whose major field of study was physical and health education were working as secondary school teachers. Similarly most persons who had specialised in elementary, kindergarten and pre-school education were working as elementary and kindergarten teachers. Persons who had majored in education, but with no particular specialisation, were most often employed as secondary school teachers or as administrators in teaching and related fields.

In all cases the association is more marked at a higher level of aggregation for occupations. Thus about two-thirds of those who had majored in general (unspecialised) education or in physical and health education and 69 per cent of those with degrees in secondary school education, were working in the aggregated group of all teaching occupations.

For graduates whose highest degree was in a field of study in the humanities and related fields, the most important single occupation was secondary school teaching: roughly one-quarter of those who had specialised in history, English or French were secondary school teachers (Figure VI.11). Here a more aggregated occupational classification also shows a more marked relationship. Thus roughly half of the graduates in these three fields were employed in the aggregated group of all teaching occupations.

As might be expected, the pattern of employment of graduates in religious studies is very different from that of the other graduates in Figure VI.11. More than half were employed as ministers of religion.

Graduates who had specialised in a field of study in the social sciences and related fields were generally employed in a wide variety of occupations (Figure VI.12). For example, for specialists in psychology, the single most important occupation was elementary and kindergarten teaching: this occupation included only 13 per cent of such specialists. More than half were employed in occupations not shown in the chart, that is, occupations in which the proportion employed was less than 10 per cent. However, graduates in law and in commerce

(accounting) were employed mainly in specific occupations: the former were working mainly as lawyers or notaries and the latter as accountants and auditors.

For social science graduates working in a variety of occupations, the spread in occupational employment does not change noticeably for a more aggregated occupational classification (Figure VI.13). A substantial proportion of specialists in psychology were employed in the groups of all managerial and administrative occupations, of all social science occupations or of all teaching occupations. Graduates in commerce (general) are an exception in this respect: nearly 60 per cent were employed in the group of all managerial and administrative occupations.

The pattern of employment of graduates in engineering fields of study shows that a substantial proportion of persons were working in occupations other than those associated with their fields of study (Figure VI.14). Almost half of the graduates in civil engineering were not employed as civil engineers, while more than two-thirds of those in chemical engineering did not work as chemical engineers. The figures do decrease using a more aggregated occupational classification but not markedly; thus one-third of the graduates in chemical engineering and more than half of those in civil engineering were employed in the group of all engineering or architectural occupations. A substantial proportion was also employed in the group of all managerial and administrative occupations. These two groups of occupations accounted for the employment of about 70 per cent of specialists in engineering fields.

Graduates in mathematics and science also appear to find employment in a wide variety of occupations (Figure VI.15). Less than one-tenth of specialists in physics were employed as physicists, and less than one-third of chemistry specialists were working as chemists. The proportion of these graduates who were employed as university teachers was also somewhat higher than that for graduates in other fields; thus at least 10 per cent of the graduates in each of the fields in mathematics and science included in Figure VI.15 were working as university teachers — this proportion is twice that for all graduates. The difference is particularly striking for specialists in physics: 15 per cent of these were employed as university teachers.

Figure VI.16 compares the occupational distribution for general arts graduates and general science graduates. The comparison is made using only the aggregated occupational classification included in Appendix I, since these graduates were employed in a very wide range of occupations. Of arts graduates, 11 per cent were employed in the group of clerical occupations, and this percentage is considerably higher than the proportion of all graduates in these occupations.

To sum up, it is clear that the occupations in which degree-holders were employed varied considerably by major field of study. Graduates in some fields, notably in health fields and in law, were employed mainly in the occupations associated with those fields. Graduates in other fields of study associated with specific occupations, such as those in engineering fields, were often employed in a wide range of occupations. Thus the evidence presented here again raises

important questions about the validity of the manpower planning approach to educational planning.

The utilisation of degree-holders

As noted in Chapter I, no direct information was collected in the survey on the extent to which degree-holders use their qualifications in the performance of their jobs. It is therefore difficult to determine whether or not most degree-holders are being effectively utilised in the economy and hence whether or not specific educational qualifications serve to increase the productivity of individuals in particular occupations.

The data on the occupations of degree-holders may however be used together with information on the educational and vocational training requirements of various occupations, to provide some indication of the utilisation of degree-holders. For example, since a university degree is not normally required for clerical occupations, a high proportion of degree-holders in such occupations could be interpreted as an indication of under-utilisation of degree-holders.

The educational and training requirements of detailed occupations have been specified in the *Canadian Classification and Dictionary of Occupations* (CCDO), published by the Department of Manpower and Immigration in 1971. The CCDO includes the training and entry requirements for almost all occupations, as well as indices of General Educational Development (GED) and of Specific Vocational Preparation (SVP) for each occupation. The GED index includes those aspects of both formal and informal education which contribute to the individual's reasoning ability and acquisition of skills, while the SVP index relates to the information, techniques and skills needed for average work performance in a specific occupation.

There are several difficulties involved in using the information in the CCDO to identify the occupations for which a university degree is necessary. Work experience and formal education are often good substitutes for each other, and there are probably many occupations in which employers would not insist on both for a job. The GED index is measured in terms of years of schooling while the SVP index is measured in terms of the specific period of preparation required for a given occupation. It is therefore difficult to combine the two indices to give a single meaningful index which would indicate the need for a university degree. The educational requirements of various occupations probably also change over time because of, for example, the introduction of higher standards by professional associations or by employers, so that the information in the CCDO may be accurate only for the period in which it was developed.

Because of such difficulties, it was decided that the information in the CCDO would be used here in an informal manner to provide a rough indicator of the occupation groups for which a university degree is usually required. On this basis, seventeen of the twenty occupation groups listed in Appendix I were classified as "degree-oriented": these include groups such as managerial and administrative, teaching and artistic, literary, recreational and related occupations. Three of the twenty occupation groups have been classified as "non-degree-oriented": clerical, sales and the "other occupations" category.

It should be emphasised that this categorisation is somewhat arbitrary and some occupations would have been wrongly classified on this basis. As a result, the proportion of degree-holders in "non-degree-oriented" occupations should not be interpreted as an indicator of the absolute level of the utilisation of degree-holders. The categorisation should, however, provide a reasonably approximate indicator of the utilisation of one type of graduate relative to another since the effects of classification errors will probably be similar in both cases. For example, the proportion of degree-holders in "non-degree-oriented" occupations in two fields of study probably provides a reasonable indicator of the utilisation of degree-holders in one compared to the other.

The data in Figure VI.17 show the proportion of degree-holders in "degree-oriented" and "non-degree-oriented" occupations for selected major fields of study. In general, graduates in the more vocation-oriented fields of study, such as fields in health, education and engineering, were more likely to be employed in "degree-oriented" occupations than were graduates in less vocation-oriented fields, such as social science and humanities. For example, six per cent of specialists in secondary schooling, as contrasted to 25 per cent of those in economics, were employed in non-degree-oriented occupations.

The data thus suggest that graduates in the more vocation-oriented fields of study are being more effectively utilised than those in the less vocation-oriented fields of study.

These data are shown in Figure VI.18 for aggregated major fields of study and by level of degree. The differences in the pattern of utilisation by field of study are much the same at this level of aggregation as at the more detailed level used above. In addition, for each field of study the proportion of degree-holders in "non-degree-oriented" occupations falls consistently with the level of degree. For example, for specialists in the humanities and related fields, the proportion of those in "non-degree-oriented" occupations was 20 per cent for those with a bachelors degree, eight per cent for those with a masters degree, and two per cent for those with a doctorate. It thus appears clear that the effective utilisation of degree-holders increases with the level of degree.

Some conclusions on occupations and major field of study

The link between the occupations and major fields of study of degree-holders has been analysed in this chapter from two perspectives. Fields of study of degree-holders in a given occupation were first examined to determine the extent to which occupations are education-specific. Not surprisingly, it was found that those occupations which require a certain skill or educational qualification, such as medicine and surgery, are highly education-specific. Many occupations, including teaching, were not highly education-specific and the persons employed in them had taken their degrees in a variety of fields.

The occupational distribution of degree-holders in a given field of study was next examined in order to determine the range of occupations in which persons from the given field were employed. It was found that degree-holders in some fields of study, notably in health fields and in law, were employed mainly in the

corresponding occupations, while graduates in other fields of study, including engineering, were generally employed in a wide range of occupations.

Many of these findings are not too surprising and in some cases they may be explained by historical factors or by problems of definition in the occupational classification. For example, the fact that a relatively low proportion of secondary school teachers had taken their highest degree in secondary school education may be due to the fact that this is a recent requirement for such teachers, so that many older teachers would not have needed a degree in this field. Similarly, degree-holders working in a “general” occupation, such as managers, may in fact need their educational qualifications for performing some of the job functions in the occupation, but this requirement would be identifiable only with detailed data on work functions.

The analysis in this chapter has some important implications for the manpower approach to planning the outputs of the university sector. One of the steps in this approach is to forecast the educational structure of different occupations and to use this to derive a forecast of the number of graduates needed at some future date (See [2]). The assumption is that there is a close link between occupation and education and that this is fairly stable or predictable over time. The analysis here clearly raises questions about the validity of this assumption. In many cases, there appears to be only a loose link between the occupations and fields of study of degree-holders, and the observed relationship seems to reflect the complex interaction of a number of factors such as the availability of different types of degree-holders and the changing educational requirements for various occupations.

In some occupations, such as medicine and surgery and engineering, there is a requirement for graduation in a particular field of study, and the data clearly indicate that these are highly education-specific occupations. At the same time, graduates in the particular field of study sometimes did not work in the corresponding occupation: for example, while graduates in medicine worked mainly as physicians and surgeons, those in, say, electrical engineering worked in a variety of occupations. The difference reflects the effects of a wide range of factors including the wages and employment opportunities in different occupations in which the particular educational qualifications are useful.

The implication of this finding is that the manpower approach may be valid only in a limited number of education-specific occupations. For example, a forecast of requirements for physicians and surgeons can be translated into a forecast of requirements for graduates in medicine, and (on the basis of the existing relationship) most of these may be expected to work in this occupation. By contrast, although a forecast of requirements for electrical engineers may be translated into a forecast of requirements for graduates in electrical engineering, it is much less certain that the same proportion of these graduates will find employment in the given occupation since the effects of all the other factors will probably change as well. Thus a forecast of employment opportunities for electrical engineers may not provide a reliable basis for planning enrolments in electrical engineering.

This difficulty is even more important in the case of those occupations, such as

economics, which are not highly education-specific. The data suggest that employment opportunities in such occupations can be filled by graduates in a variety of fields of study, so that there can be no reliable way of deriving forecasts of graduates required in specific fields.

To sum up, the analysis suggests that the practice of manpower forecasting, based on the simple mechanical transformation of occupational employment into requirements for graduates in different fields of study, cannot provide a reliable method for planning enrolments in the university sector. This is not to say that the information on the fields of study of persons in various occupations does not provide a valid basis for manpower counselling or planning. The critical point is that it does not seem reasonable to derive *quantitative* forecasts of the demand for persons in particular fields of study on the basis of the loose relationship between occupations and fields of study. Such forecasts can only create an impression of precision which is not borne out by this analysis and hence may be misleading for planning purposes.

However, it is clear that the information may be used in an informal or non-quantitative way as an aid to decision-making. For example, it is useful for students to know that about half of the specialists in geology were employed as geologists since this provides a rough indicator of the chance of obtaining employment in the occupation given the field of study. Similarly, it is useful for educational institutions to know that many secondary school teachers have specialised in education or in the humanities, so that a drop in the demand for such teachers may cause a reduction in enrolments in both fields.

Finally, it should be noted again that the analysis carried out in this chapter was based on selected occupations (covering 55 per cent of degree-holders in all occupations) and on selected fields of study (covering 64 per cent of degree-holders in all fields). The above conclusions are based on an analysis of part of the available data, and it would clearly be interesting to extend the analysis to cover all occupations and fields of study. It would also clearly be useful to carry out the analysis separately for different categories of degree-holders, such as by age, sex and province, since important similarities and differences may not be apparent at the level of aggregation used here.

FIGURE VI.1 Proportion of persons with a university degree in selected occupations in 1971

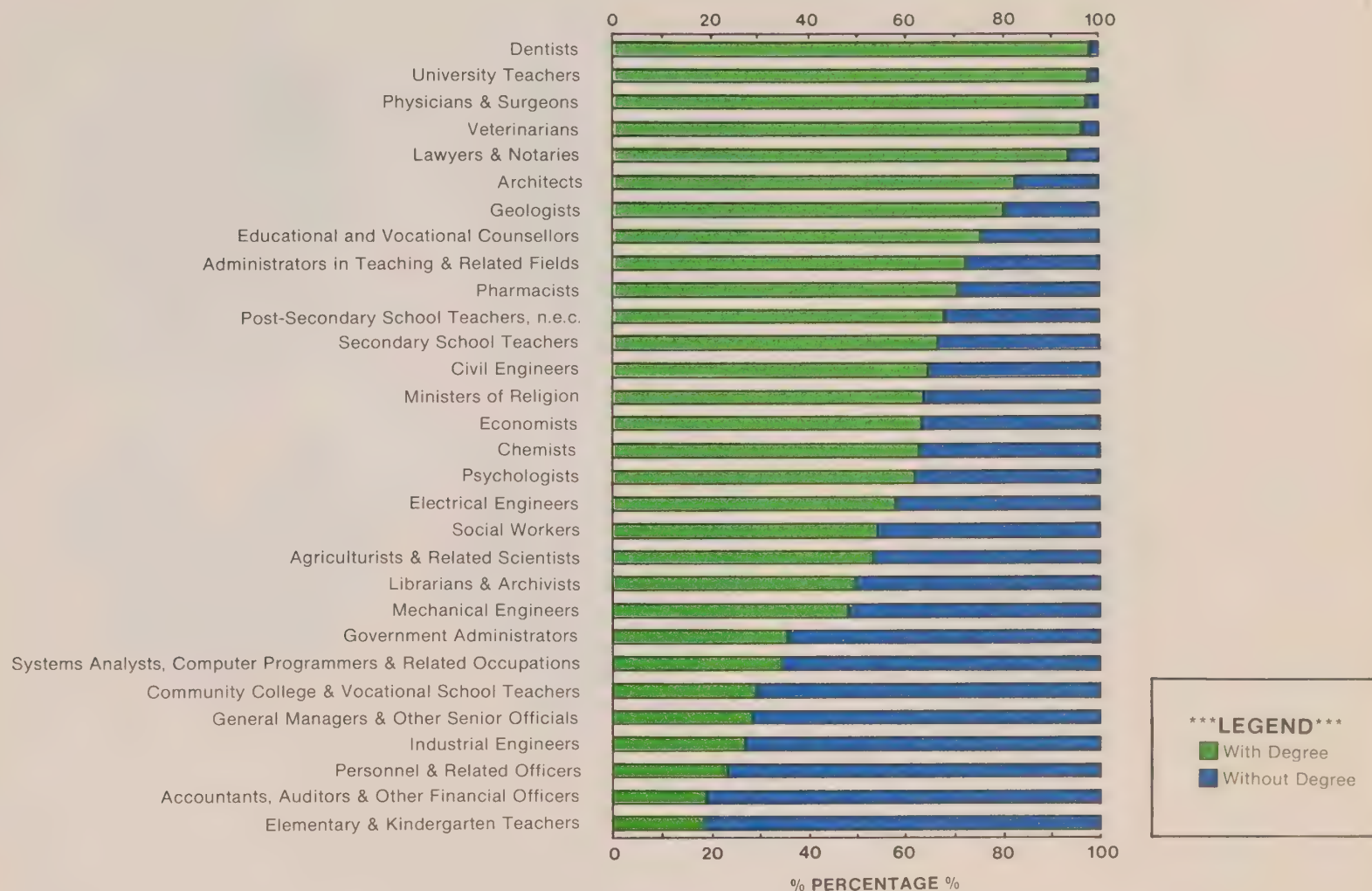
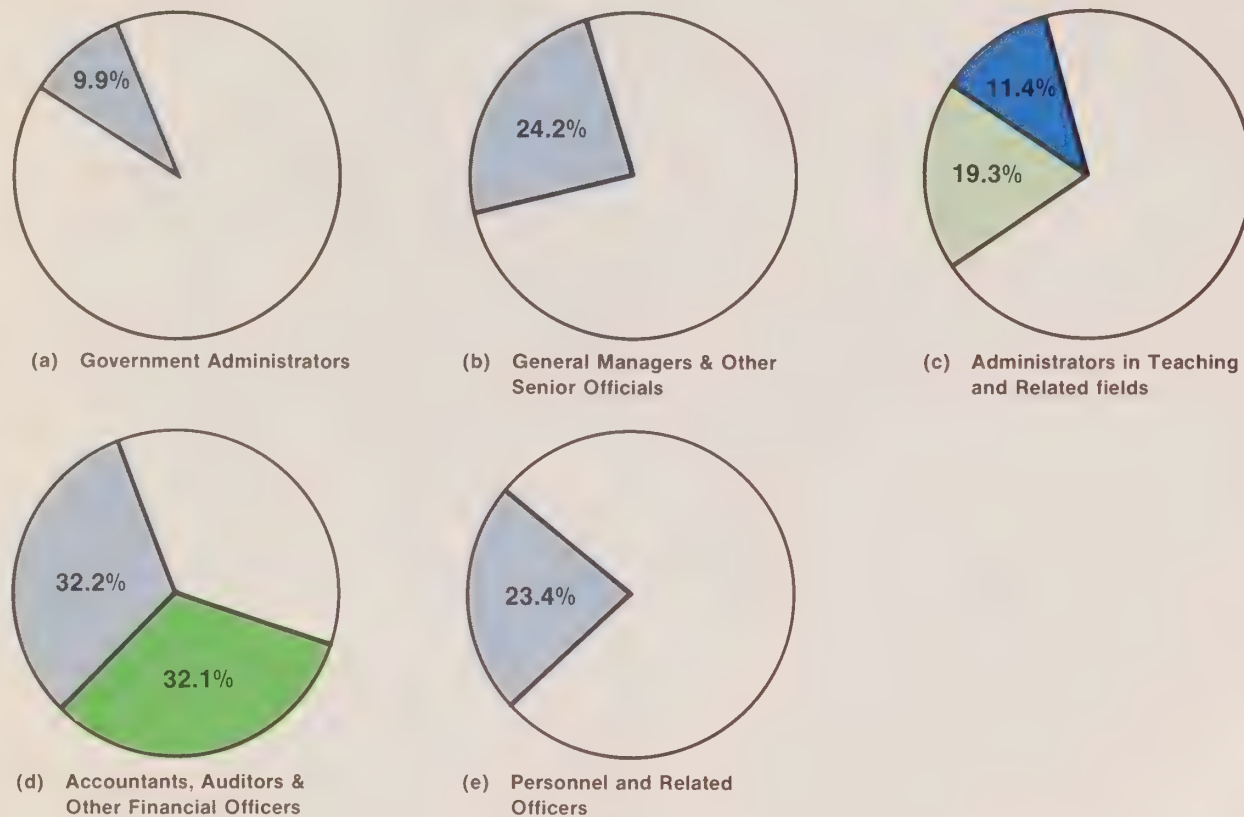


FIGURE VI.2 Selected major fields of study by occupation: managerial and administrative occupation group



*** **LEGEND** ***

FIELD OF STUDY






- Commerce (General) 
- Commerce (Accounting) 
- Secondary Schooling 
- Educational Administration and Organisation 
- Field of study not specified above 

FIGURE VI.3 Selected major fields of study (aggregated) by occupation: managerial and administrative occupation group

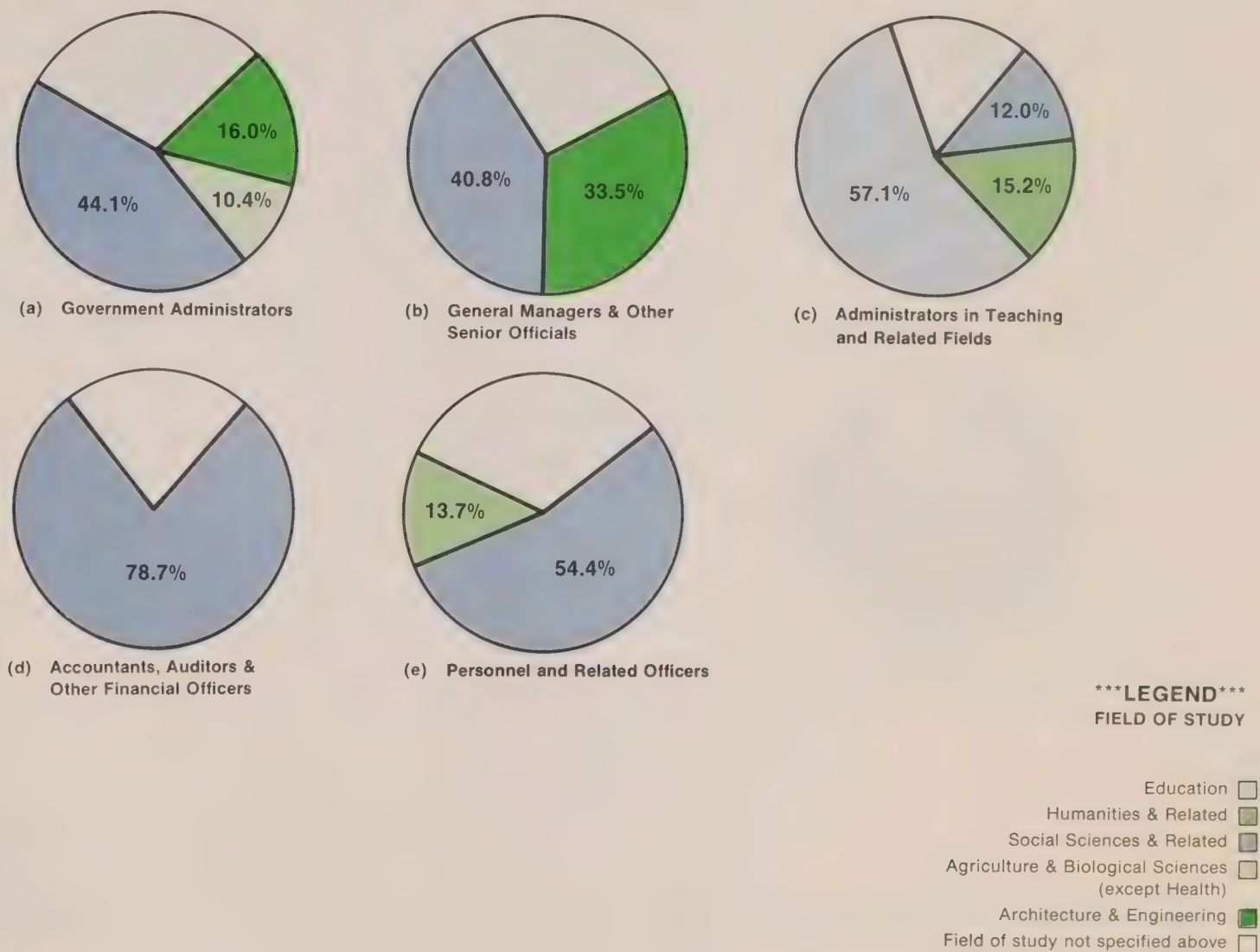
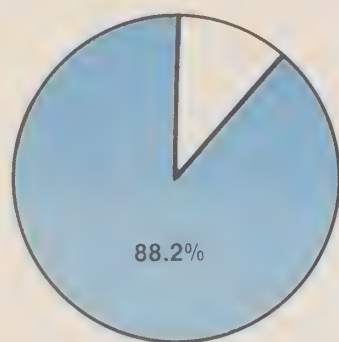
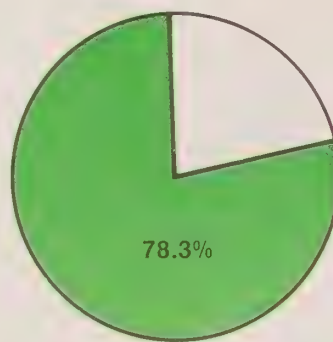


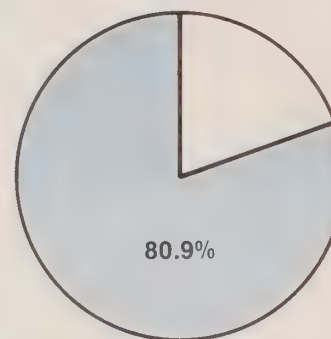
FIGURE VI.4 Selected major fields of study by occupation: architects and engineers



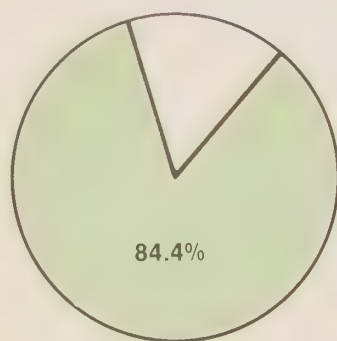
(a) Architects



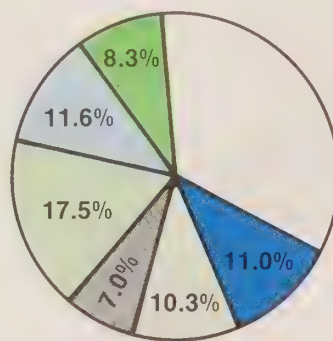
(b) Civil Engineers



(c) Electrical Engineers



(d) Mechanical Engineers



(e) Industrial Engineers (1)

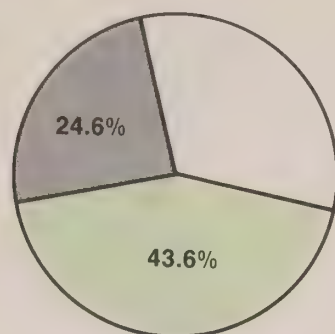
*** **LEGEND** ***

FIELD OF STUDY

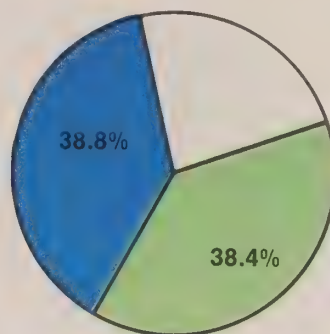
- Architecture
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering
- Industrial Engineering
- Chemical Engineering
- Commerce (General)
- Field of Study not specified above

(1) Note that two fields with less than 10% of industrial engineers are included to show the variety of fields in the occupation.

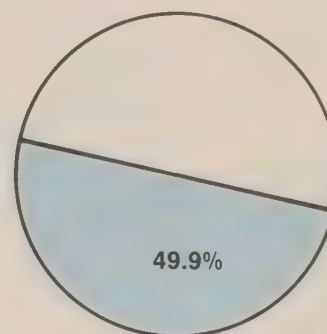
FIGURE VI.5 Selected major fields of study by occupation: social sciences and religion



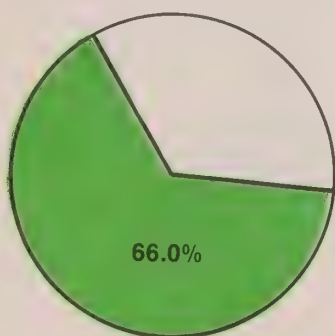
(a) Economists



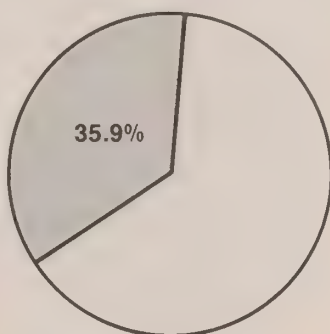
(b) Psychologists



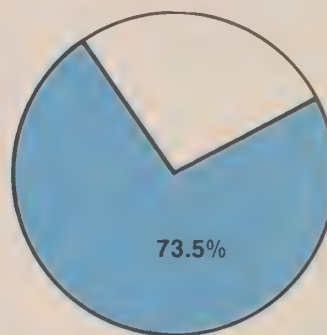
(c) Social Workers



(d) Librarians and Archivists









(e) Educational and Vocational Counsellors



(f) Ministers of Religion

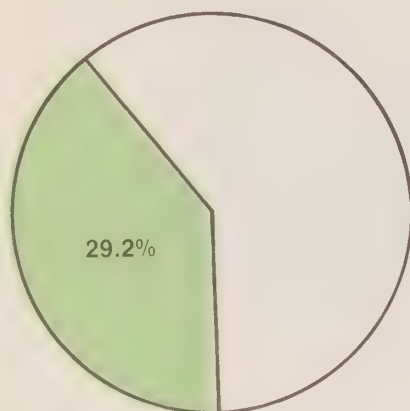
*****LEGEND*****
FIELD OF STUDY

Economics 
Commerce (General) 
Field of study not specified above 

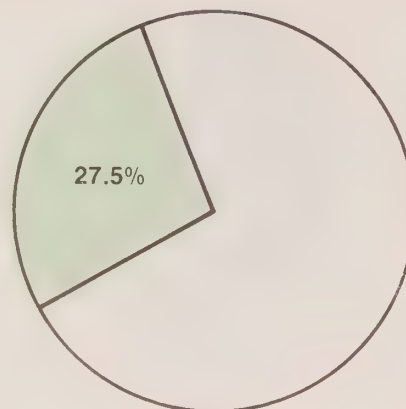
Psychology (Clinical) 
Psychology (Other) 
Social Work 

Library and Records Science 
Counselling & Guidance 
Religious Studies 

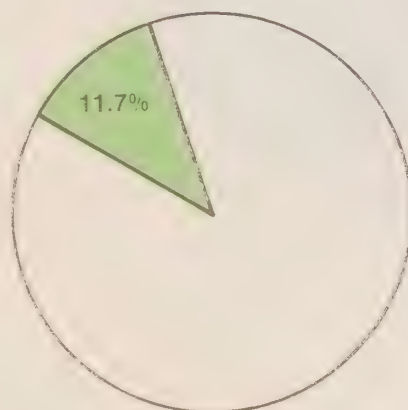
FIGURE VI.6 Selected major fields of study by occupation: teachers



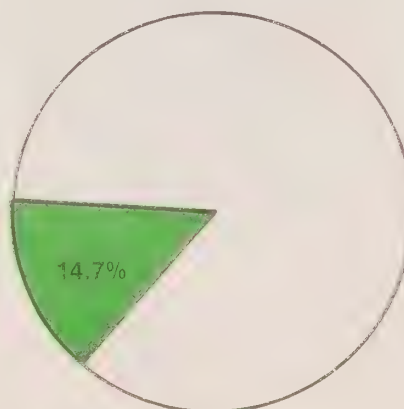
(a) Secondary School Teachers



(b) Elementary & Kindergarten Teachers



(c) Community College & Vocational School Teachers



(d) Post-Secondary School Teachers, n.e.c.

*****LEGEND*****
FIELD OF STUDY





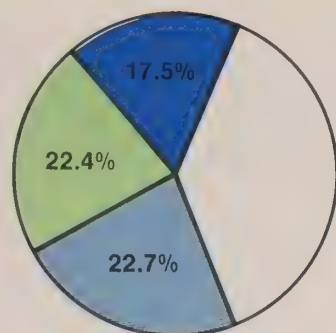
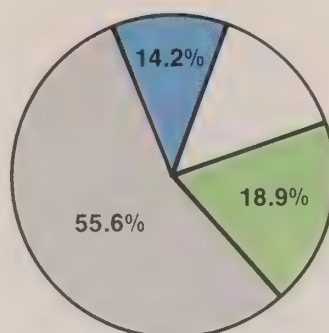
- Secondary Schooling 
- Elementary, Kindergarten & Pre-School Education 
- Nursing (including Nursing Education) 
- Field of study not specified above 

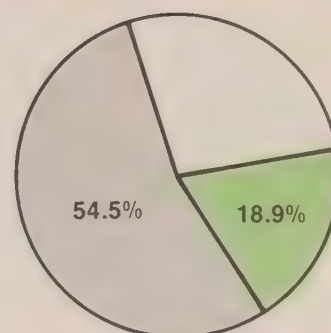
FIGURE VI.7 Selected major fields of study (aggregated) by occupation: teachers



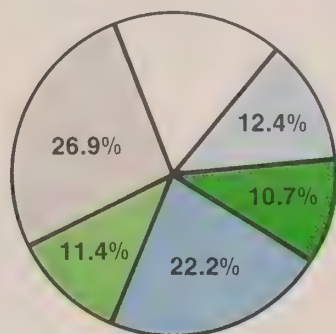
(a) University Teachers



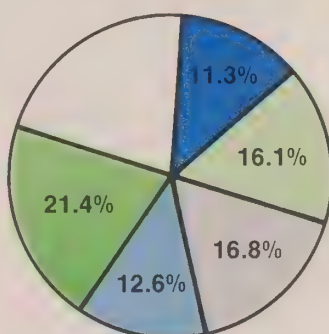
(b) Elementary & Kindergarten Teachers



(c) Secondary School Teachers



(d) Community College & Vocational School Teachers

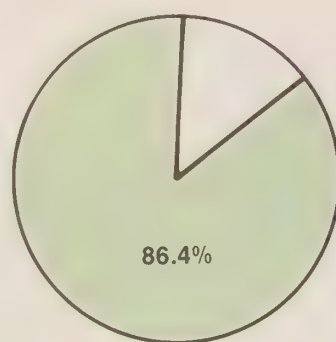


(e) Post-Secondary School Teachers, n.e.c.

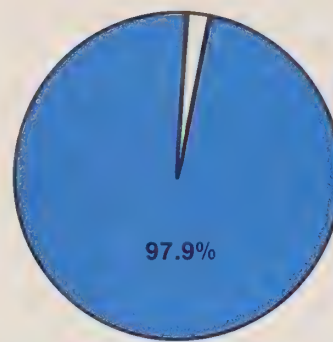
LEGEND
FIELD OF STUDY

- Education
- Humanities & Related
- Social Sciences & Related
- Architecture & Engineering
- Medicine, Dentistry & Health
- Mathematics and Physical Sciences
- Agriculture & Biological Sciences (except Health)
- Fields of Study not specified above

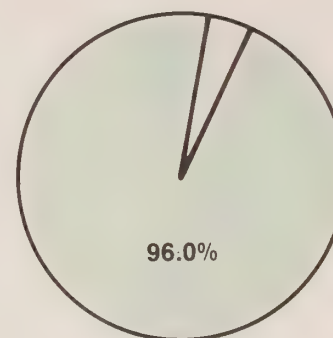
FIGURE VI.8 Selected major fields of study by occupation: health & law occupations



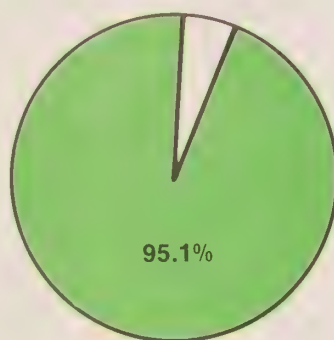
(a) Physicians and Surgeons



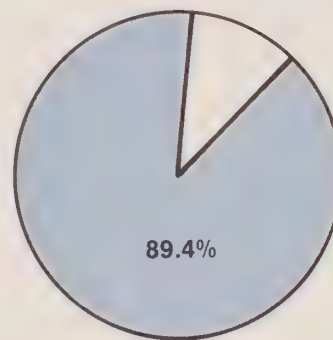
(b) Dentists



(c) Veterinarians



(d) Pharmacists



(d) Lawyers and Notaries

***** LEGEND *****
FIELD OF STUDY







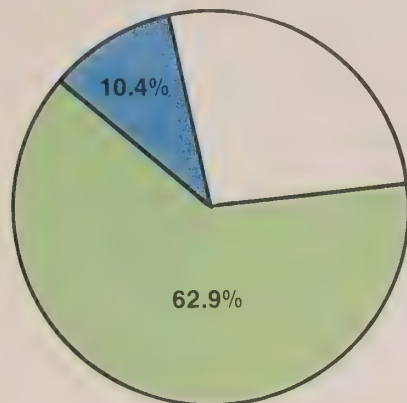
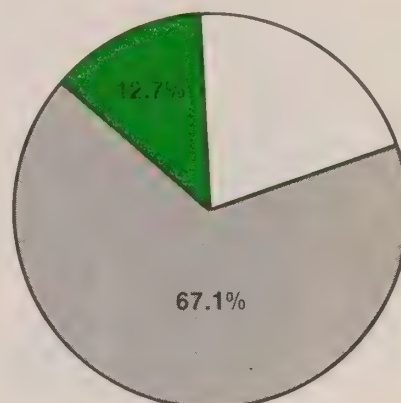
- Medicine, Family or General Practice 
- Dentistry 
- Veterinary Medicine & Science 
- Pharmacy 
- Law 
- Field of Study not specified above 

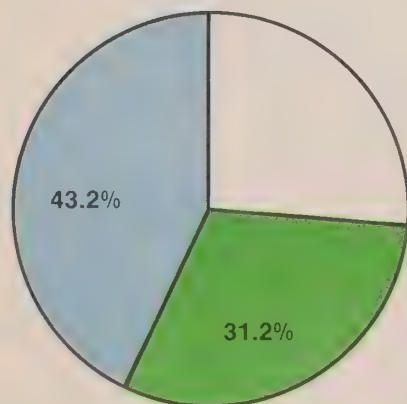
FIGURE VI.9 Selected major fields of study by occupation: occupations in natural sciences and mathematics



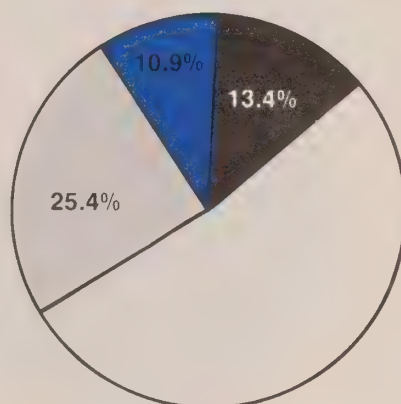
(a) Chemists



(b) Geologists



(c) Agriculturists & Related Scientists

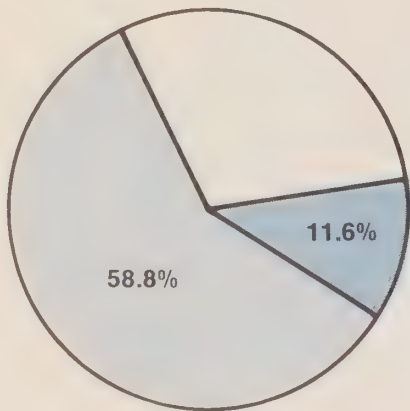


(d) Systems Analysts, Computer Programmers & Related Occupations

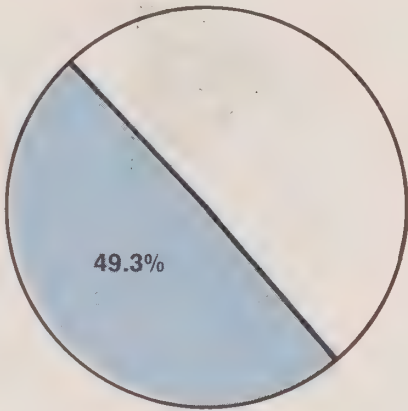
LEGEND
FIELD OF STUDY

- Chemistry
- Biochemistry
- Geological Engineering
- Geology and Related Earth Sciences
- Computer science
- Mathematics, Other
- Agriculture
- Forestry
- Commerce (General)
- Field of study not specified above

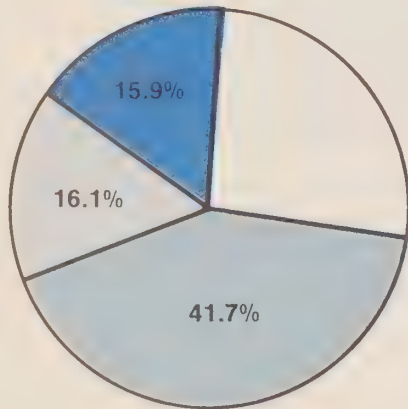
FIGURE VI.10 Selected occupations by major field of study: education fields



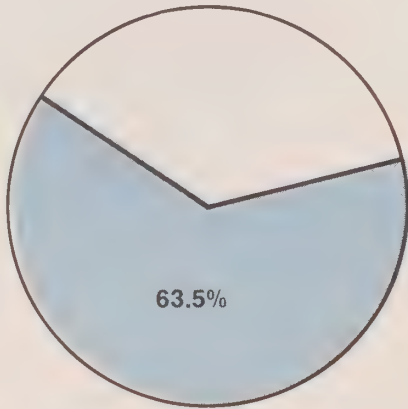
(a) Elementary, Kindergarten and Pre-School Education



(b) Physical & Health Education & Recreation



(c) Education (unspecialized)

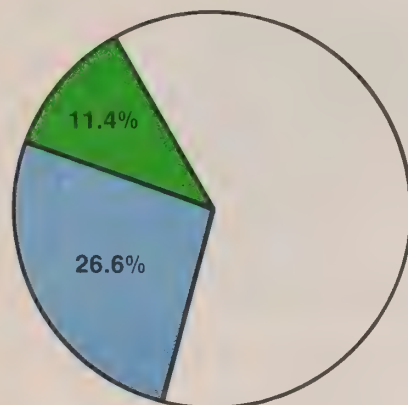


(d) Secondary Schooling

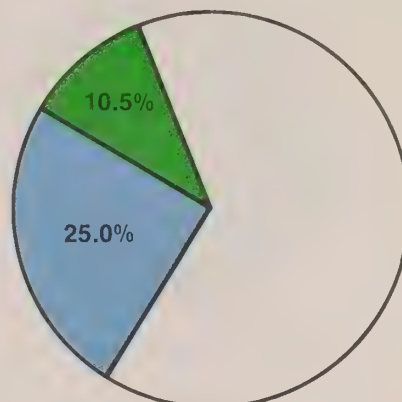
LEGEND
OCCUPATION

- Secondary School Teachers
- Elementary & Kindergarten Teachers
- Administrators in Teaching and Related Fields
- Occupation not specified above

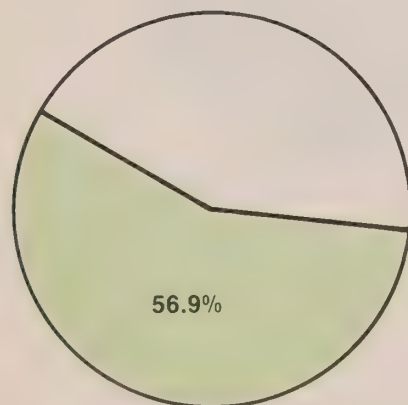
FIGURE VI.11 Selected occupations by major field of study: humanities and related



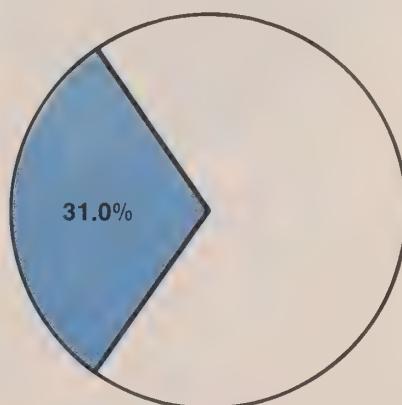
(a) History



(b) Modern Language and Literature (English)



(c) Religious Studies



(c) Modern Language and Literature (French)

*****LEGEND*****
OCCUPATION





Elementary & Kindergarten Teachers 
Secondary School Teachers 
Ministers of Religion 
Occupation not specified above 

FIGURE VI.12 Selected occupations by major field of study: social sciences and related fields

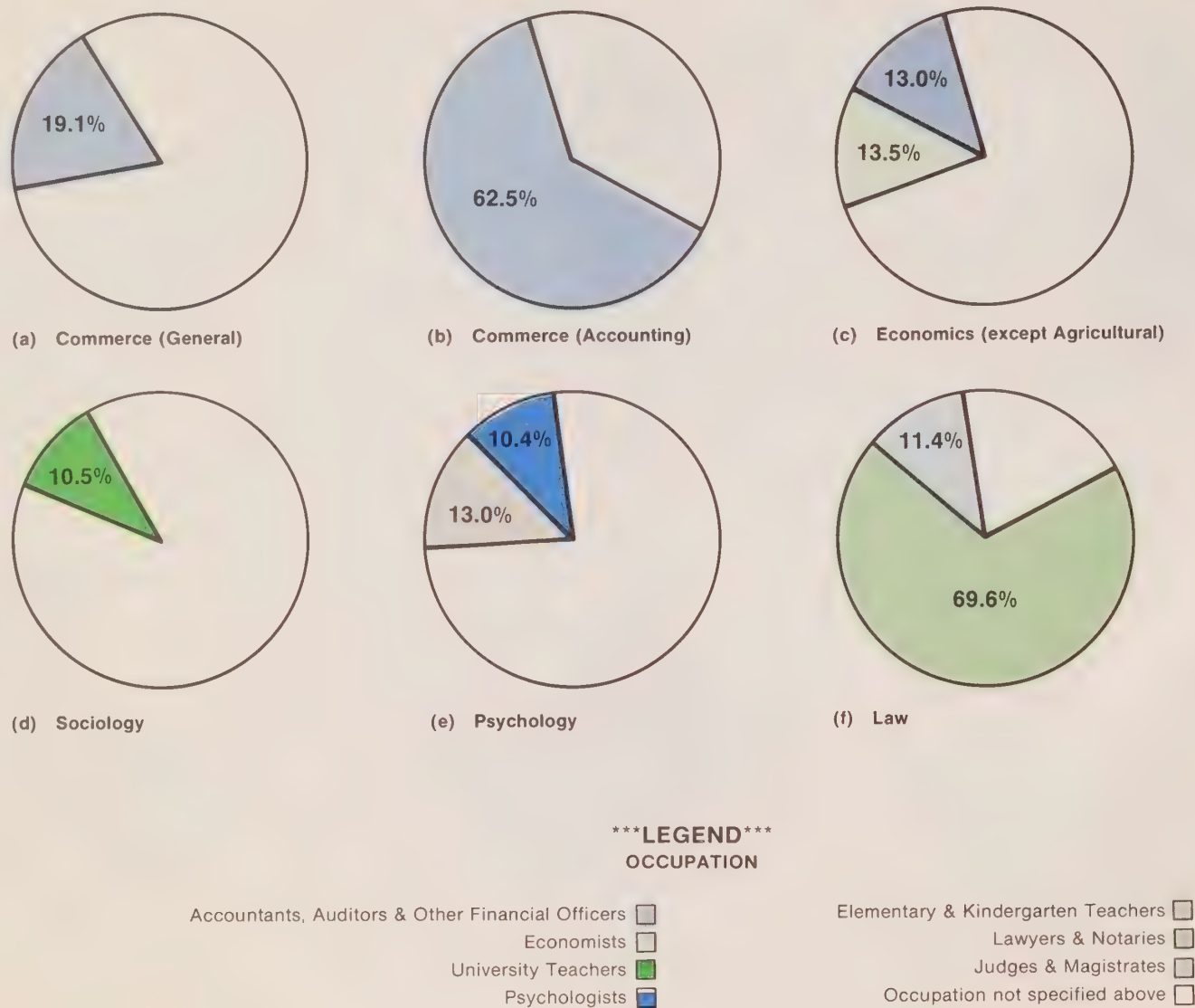
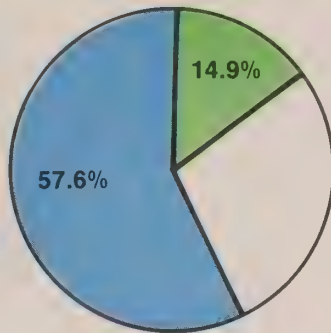
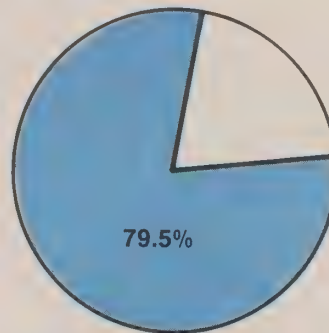


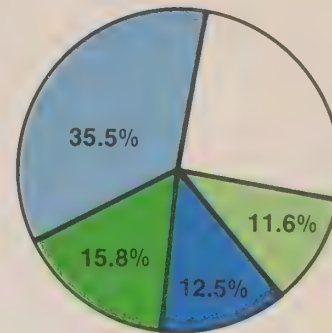
FIGURE VI.13 Selected occupations (aggregated) by major field of study: social sciences and related fields



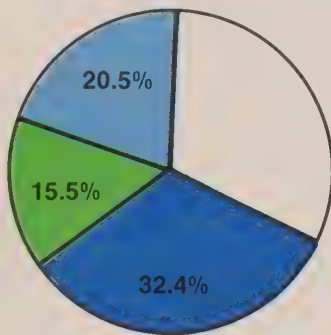
(a) Commerce (General)



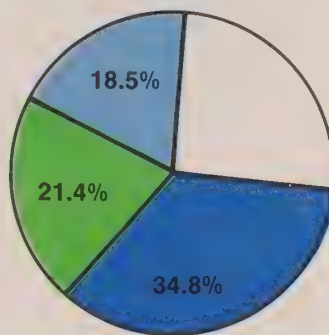
(b) Commerce (Accounting)



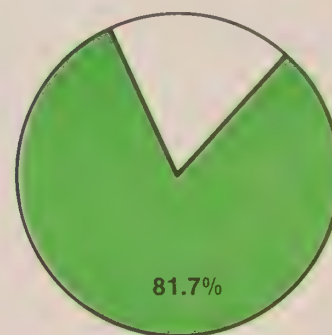
(c) Economics (except Agricultural)



(d) Sociology








(e) Psychology



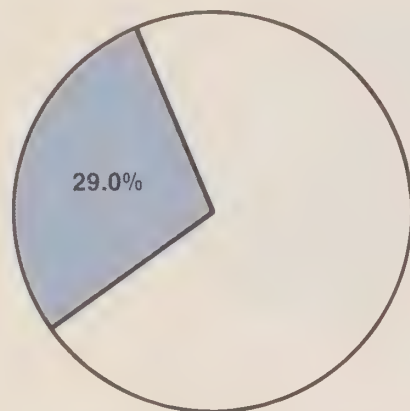
(f) Law

*****LEGEND*****
OCCUPATION

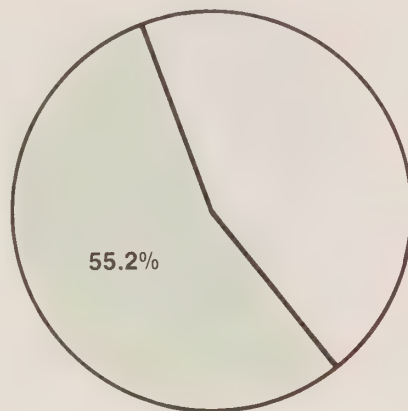
- Managerial, Administrative & Related Occupations 
- Sales Occupations 
- Occupations in Social Sciences & Related Fields* 
- Teaching & Related Occupations 
- Occupation not specified above 

*Including occupations in social sciences, social work & related fields, law & jurisprudence, library, museum & archival sciences & other occupations in social sciences & related fields, n.e.c.

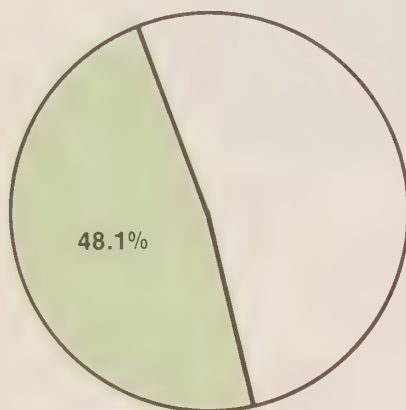
FIGURE VI.14 Selected occupations by major field of study: engineering fields



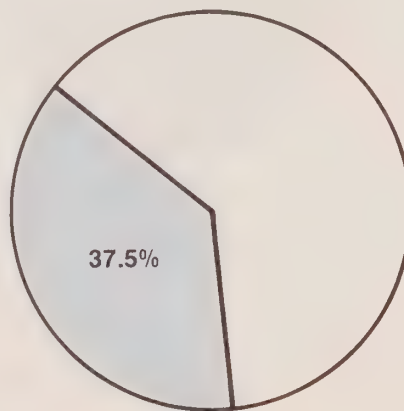
(a) Chemical Engineering



(b) Civil Engineering



(c) Electrical Engineering

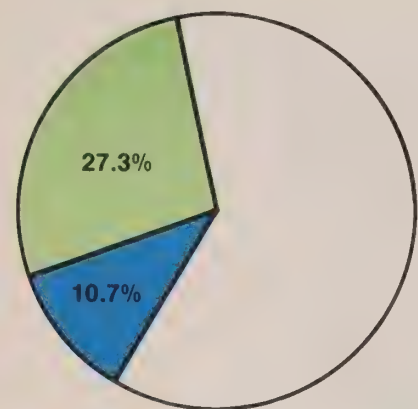


(d) Mechanical Engineering

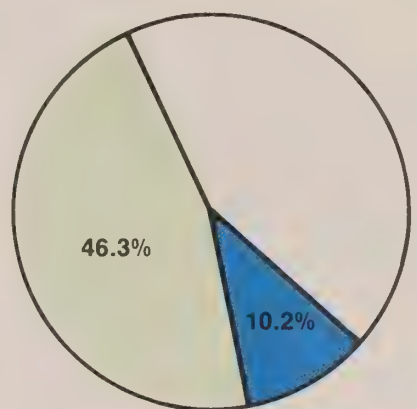
***** LEGEND *****
OCCUPATION

- Chemical Engineers ☐
- Civil Engineers ☐
- Electrical Engineers ☐
- Mechanical Engineers ☐
- Occupation not specified above ☐

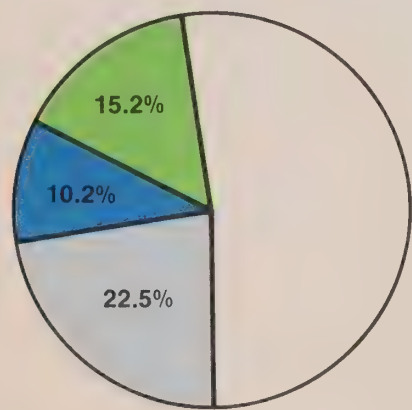
FIGURE VI.15 Selected occupations by major field of study: mathematics and science



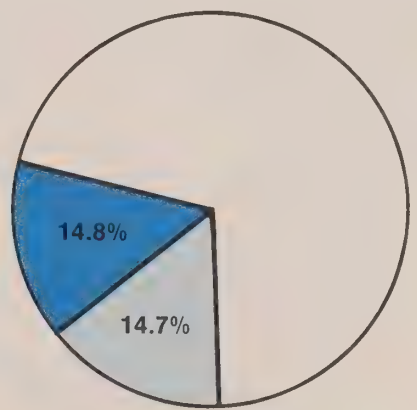
(a) Chemistry



(b) Geology and Related Earth Sciences



(c) Mathematics, Other Than Statistics



(d) Physics

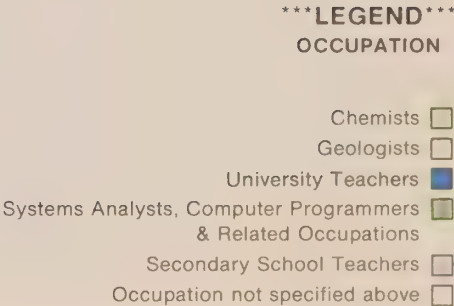
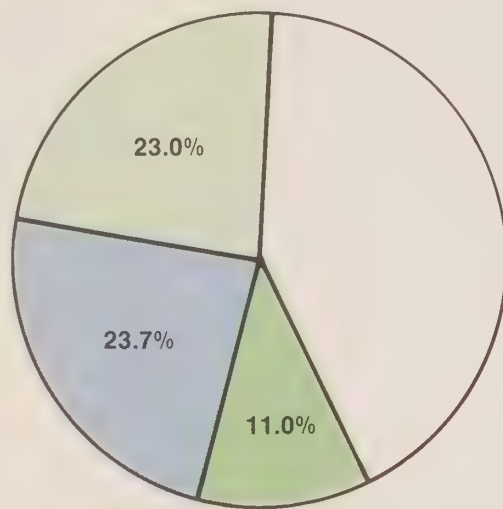
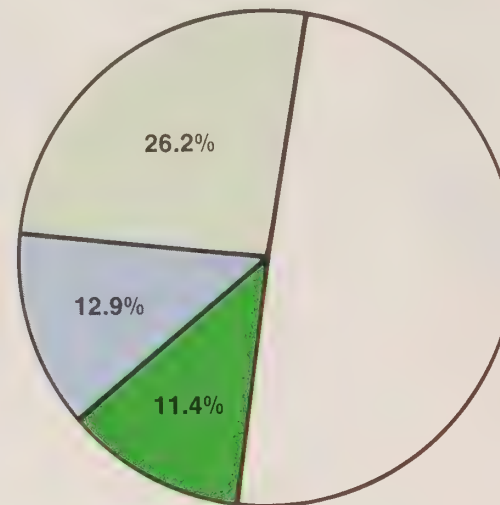


FIGURE VI.16 Selected occupations (aggregated) by major field of study: general arts and science



(a) No Major



(b) Science (General)

*****LEGEND*****
OCCUPATION






- Managerial, Administrative & Related Occupations 
- Elementary & Secondary School Teaching & Related Occupations 
- Clerical & Related Occupations 
- Sales Occupations 
- Occupation not specified above 

FIGURE VI.17 Proportion of non-degree-oriented occupations by major field of study

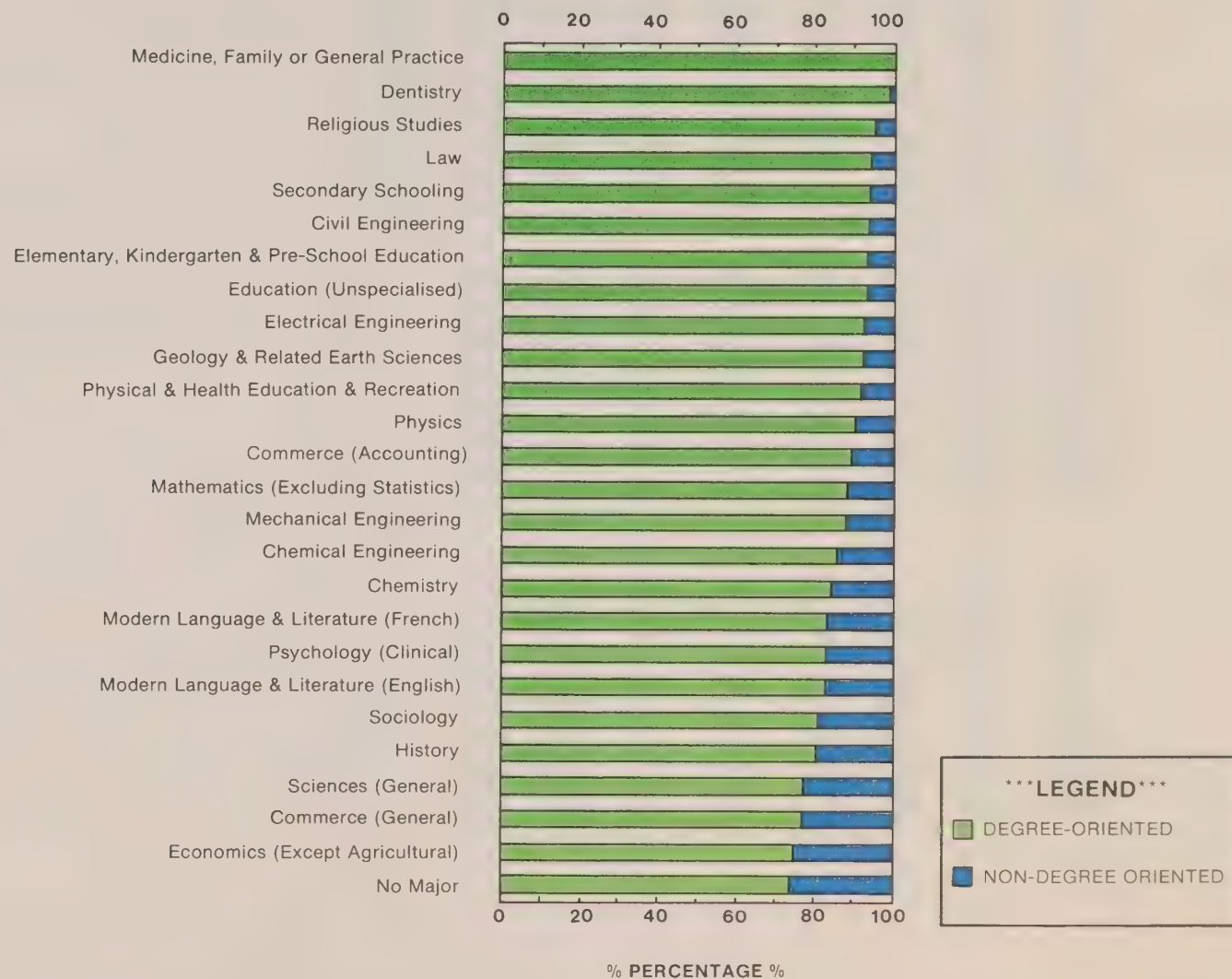
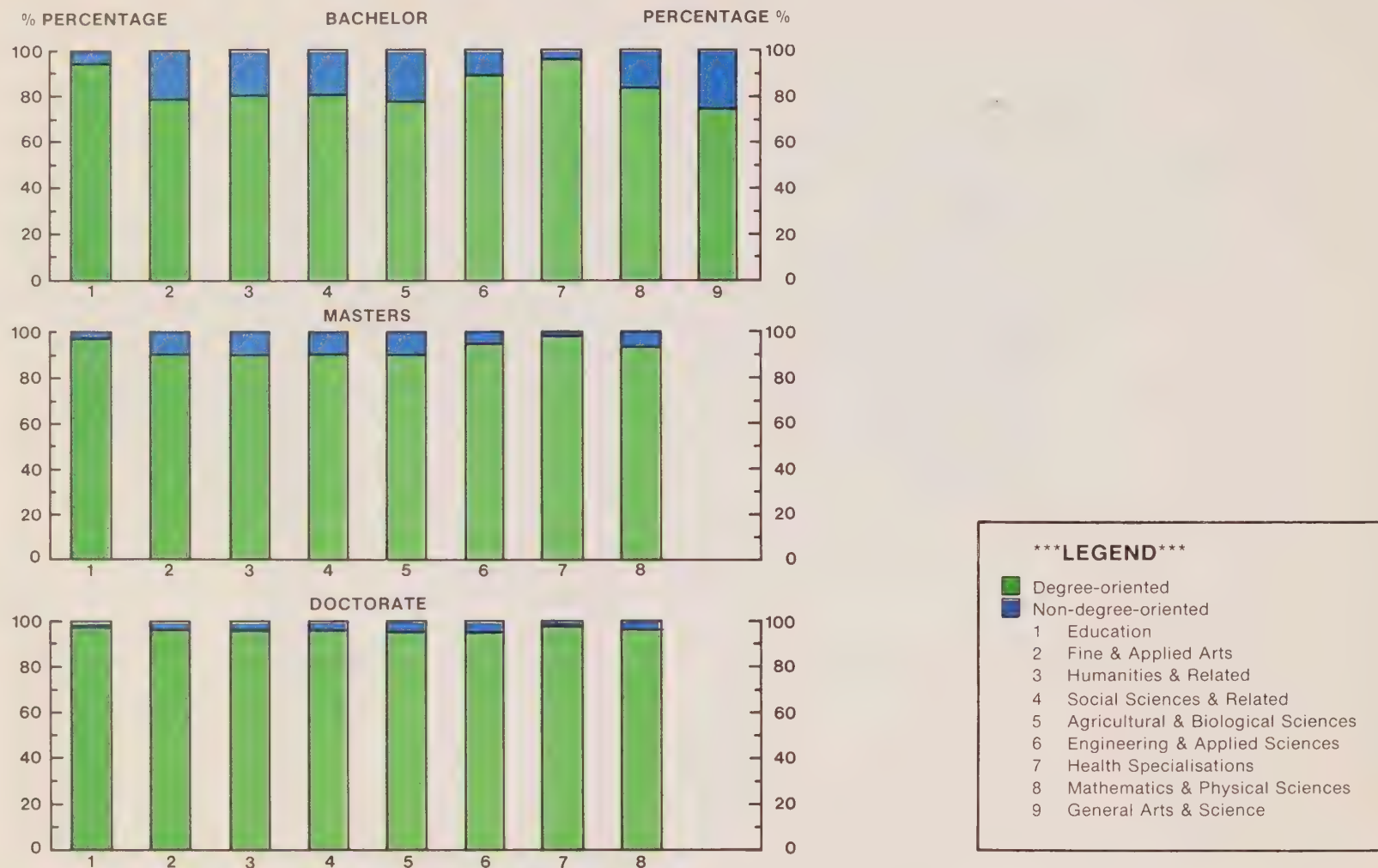


FIGURE VI.18 Proportion of non-degree-oriented occupations by major field of study and level of degree



Chapter VII

Occupational Mobility

Introduction

Respondents to the 1973 Highly Qualified Manpower Survey were asked to provide information on their current jobs as well as on certain jobs they had held in the past. This information has been coded to provide data on the occupations held by degree-holders at various points in their careers. Data on their occupations in 1971 are also available since they had been asked in the 1971 census to provide information on their jobs in the week preceding the census. These data together provide a rich base for studying the career patterns of degree-holders in Canada.

Some of the changes in the occupations of degree-holders are explored in this chapter. The analysis is concerned with the changes in occupation made by degree-holders in the period 1971-1973. Occupation in 1973 is defined here in terms of the job of longest duration held in the twelve months prior to response. As noted in Appendix I, the date of response varied substantially for different respondents so that there is no common reference period in 1973 for specifying the occupation of all respondents. Thus the period over which these changes in occupation took place is only approximately equivalent to 1971-1973.

As noted in Chapter VI, employment in some occupations is limited to graduates in certain fields of study, so that movements into those occupations will depend on the supply of individuals, in the required fields of study, who were employed outside the corresponding occupations. For example, only a small proportion of medical graduates were not working physicians and surgeons, so the extent of mobility into this occupation would tend to be limited. By contrast, a substantial proportion of engineering graduates were not employed as engineers, so movement into engineering occupations could be substantial.

The analysis in Chapter VI suggests, however, that employment in most occupations is open to graduates in many different fields of study. Thus, in general, movements into and out of various occupations will be determined by a wide range of other factors. For example, individuals may change occupation in order to satisfy their work preferences or their personal goals, but occupational differences in earnings, hours of work, promotion prospects and other such

factors are important as well. Individuals may also change occupation as a result of some other change; for example, an individual may change his place of residence and this may bring about a change in his occupation.

It follows therefore that occupational mobility may be an important aspect of labour market adjustment, and it should be taken into account in planning to meet the changing manpower demands of the economy. For example, data on occupational mobility may be used to identify the existence of career ladders on which individuals move as they gain working skills and experience, and this may have implications for the training of new graduates to work near the bottom of the ladder (see [31]). Similarly, data on net movements out of various occupations may be used to estimate the losses from those occupations resulting from occupational mobility, and this may be combined with attrition through mortality and retirement (See Chapter V) to provide a more accurate estimate of the replacement jobs becoming available in those occupations.

The next section of this chapter deals with some basic data on occupational change in the period 1971-1973. This is followed by a section describing occupational mobility by factors such as age, sex and province of residence. The patterns of movement between various occupation groups are then examined, followed by some conclusions of the analysis.

Basic data on occupational mobility

Nearly 500 thousand of the estimated total of 630 thousand degree-holders in 1971 had worked both in 1971 and in the twelve months prior to response, and roughly 224 thousand of these had changed occupation since the census. Thus 45 per cent of degree-holders in 1971 had changed occupation in approximately two years. (Change of occupation here is based on the detailed classification of 115 categories listed in Appendix II. It includes, for example, changes from "chemists" to "general managers and other senior officials" and from "psychologists" to "social workers").

This proportion is highly significant, as it suggests that many degree-holders are very flexible in terms of the functions they perform. The evidence here is also

consistent with the analysis in Chapter VI which showed that in many cases there does not appear to be a rigid relationship between field of study and occupation.

Because of the surprising size of this proportion, an attempt was made to verify its accuracy. Since the boundaries between occupations may be difficult to define, it is quite possible that a large number of the recorded changes in occupation might be due simply to classification errors; thus the size of the proportion may simply reflect these errors and not true changes in occupation.

Occupation in both the census and in the 1973 Highly Qualified Manpower Survey was coded on the basis of three pieces of information provided by the respondent: kind of work, duties, and job title. Thus individuals did not directly specify their occupations, and errors in classification could have arisen only at the coding stage. In view of the stringent controls usually applied by Statistics Canada, it seems unlikely that coding errors could account for a substantial part of the observed changes in occupation.

Data on changes in occupation cross-tabulated with changes in industry also appear to support this conclusion. Since the name of the employer was used in determining an individual's industry of employment, the possibility of misclassification is clearly very small; therefore, changes in industry are probably fairly reliable. The data in Table VII.1 show that nearly one-third of all degree-holders had changed industry in the period 1971-73. Since a change of industry will in most cases involve a change of employer, and since some individuals would have changed jobs without having changed employer or industry, it seems reasonable to assume that the proportion of persons who changed jobs could have been somewhat higher than one-third.

TABLE VII.1
Occupational (Detailed)¹ Change by
Industrial² Change 1971-73

		Change in Industry		
		No Change	Change	Number (000)
Change in Occupation	No Change	(%) 65.9	(%) 29.9	270.5
	Change	34.1	70.1	223.6
Total	%	100.0	100.0	
	Number (000)	340.6	153.5	494.1

¹Based on a classification of occupations in 115 categories. See Appendix II.
²Based on the four-digit industrial classification of the Standard Industrial Classification (1970 edition).

It also seems reasonable to assume that high job mobility may itself imply high occupational mobility of degree-holders. In many cases, job changes involve a promotion and hence a movement towards more administrative and managerial responsibilities. In other cases, and especially for new graduates, individuals may temporarily work in certain occupations because of existing labour market conditions; at the same time, they may be anxious to move to different occupations with higher incomes or in which they feel they can make better use of their education. It is probably also true that many job changes, which involve a change in industry, will also involve a change in occupation because of differences in the occupations associated with different industries: for example, a change from a manufacturing industry to a service industry will generally involve a change in occupation for degree-holders.

The level of aggregation of the occupational classification used is another factor affecting the possibility of coding errors in the occupational mobility data. Thus the possibility of coding errors is probably higher in a detailed occupation classification than in an aggregated one. For example, while it may not always be easy to be consistent in discriminating between different types of managers, between different types of engineering occupations, or between different types of social science occupations, it is surely less difficult to discriminate correctly between the groups of managerial occupations and of engineering occupations and of social science occupations.

The data in Table VII.2 compare the occupational mobility for the period using a detailed occupational classification of 115 categories and an aggregated occupational classification using 20 categories of degree holders who had changed occupation. This is somewhat lower than the 45 per cent who had changed occupation in the detailed classification. The difference is not surprising, however, since the extent of occupational mobility will also depend on the classification used. Thus the fact that occupational mobility using the aggregate classification was also fairly high supports the view that the occupational mobility data were reasonably accurate.

Factors affecting occupational mobility

Occupational mobility is obviously determined by a wide range of factors such as age, sex, and field of study. The effects of some of these factors are examined in this section using data on movements between the aggregated groups of occupations listed in Appendix II.

The data in Figure VII.1 show how occupational mobility in the period 1971-73 varied by sex and by age in 1973. The proportion who had changed occupation in the period 1971-73 was highest for those under 25 for both males and females; it fell somewhat for the next age group and remained fairly constant over the broad age range 30-64.

This is not surprising since some of the younger degree-holders in 1971 would have been students or new graduates holding temporary or summer jobs not related to their educational background. Moreover young degree-holders are likely not only to change jobs fairly frequently, but also to change occupation until they

TABLE VII.2
Occupational (Detailed and Aggregate)¹
Change 1971-1973

		Occupational Change 1971-1973	
		Detailed Classification	Aggregate Classification
No Change		% 54.8	% 67.6
Change		45.2	32.4
Total	%	100.0	100.0
	Number (000)	492.8	492.8

¹The detailed classification is based on 115 categories.
The aggregate classification is based on 20 categories.
See Appendix II.

TABLE VII.3
Occupational (Aggregate)¹ Change
by Educational Change², 1971-1973

		Educational Change	
		No Change	Change
Occupational Change	No Change	% 68.9	% 47.6
	Change	31.1	52.4
Total	%	100.0	100.0
	Number (000)	463.8	29.3

¹Based on a classification of occupations in 20 categories. See Appendix II.

²Based on additional degrees obtained in the period 1971-73.

find one they consider to be suitable; however, such changes will tend to fall as age and experience increase. At the same time, additional mobility takes place through promotions to administrative and managerial positions, and this will tend to increase with age and experience.

Occupational mobility for females was slightly higher than that for males for all ages except 25-29; in total, about 32 per cent of males and 35 per cent of females

had changed occupation in the period 1971-73. Thus occupational mobility seems to be fairly independent of sex.

Individuals who had up-graded their educational qualifications in the period 1971-73 were also more likely to have changed occupation than those who did not obtain additional degrees or diplomas. Slightly more than half of those who obtained another qualification in 1971-73, but less than one-third of those who did not, had changed occupation in the period (Table VII.3). However, only 29 thousand persons had in fact obtained an additional qualification so that the impact on total occupational mobility would have been fairly small.

TABLE VII.4
Occupational (Aggregate)¹ Change
by Change in Province of Residence 1971-1973

		Change in Province	
		No Change	Change
Occupational Change	No Change	% 68.1	% 53.2
	Change	31.9	46.8
Total	%	100.0	100.0
	Number (000)	477.2	15.6

¹Based on a classification of occupations in 20 categories. See Appendix II.

Occupational mobility also appears to be slightly higher for persons who had changed province of residence than for those who had not (Table VII.4). However, in this case too, the number who had changed province was small relative to the number who had changed occupation so that its impact on total occupational mobility would have been small.

The proportion of persons who had changed occupation in the period 1971-73 was also much the same for persons living in different provinces (Figure VII.2). In particular, the proportion of degree-holders living in Quebec who had changed occupation was the same as that in Ontario; this suggests that the patterns of occupational change are similar in both provinces and hence that occupational mobility may then have been independent of social and cultural differences between provinces.

The data in Figure VII.3 show the extent of occupational mobility by major field of study (based on aggregated fields). The proportion who had changed occupation in 1971-73 varied from a low of 15 per cent in medicine, dentistry and

health to a maximum of 45 per cent in fine arts and music. However the proportion in the other fields of study was much the same (roughly 35 per cent) although it was slightly lower in the more vocational fields such as education and architecture and engineering.

Occupational mobility also varied by type of degree (Figure VII.4). Only about 10 per cent of those with a first professional degree in medicine, dentistry or veterinary science had changed occupation. As noted in the introduction to this chapter, this is to be expected since most persons with such degrees were working in the corresponding occupations, and so the occupational mobility of this group would necessarily be low. By contrast, occupational mobility of holders of other types of degree was greater: about 35 per cent of those with undergraduate or masters degrees and 30 per cent of those with doctorates had changed occupation in the period.

Patterns of movement from one occupation group to another

It was pointed out above that on the basis of the detailed classification of occupations in 115 categories (see Appendix II), 223 thousand persons had changed occupation in the period 1971-73. On the basis of a more aggregated classification using 20 categories (See Appendix II) the number who had changed occupation group was 160 thousand. Thus, nearly 72 per cent of these changes referred to groups of occupations rather than to detailed occupations. In other words, most occupational changes occurred between rather than within groups: for example, between the group of managerial and administrative occupations and the group of architects and engineers, rather than within these groups. It follows that the main patterns of occupational mobility can probably be identified using only changes between the 20 occupation groups listed in Appendix II. The use of only twenty categories is also preferable since it makes presentation and discussion of the results much easier.

The data in Figure VII.5 show the amount of mobility that occurred in the period 1971-73 for persons in these occupational groups. As would be expected, individuals in law and health diagnosing occupations were the least mobile: only four per cent and seven per cent respectively of persons in these groups had moved to a different occupation group during 1971-73. At the other extreme, nearly 80 per cent of those in the residual or "other" occupation category had changed occupation group. The "other" occupation group includes a wide range of occupation groups such as fishing, processing occupations and construction trades occupations (see Appendix II), in each of which there was only a small number of degree-holders. Since a degree is not normally a requirement for many of these occupations, it is not surprising that mobility out of this group would have been high. Mobility out of social science, clerical, sales and service occupations was also fairly high.

In absolute terms, most of the observed out-mobility occurred in six occupation groups. Some 71 per cent of the persons who changed occupation group were working in the following occupation groups in 1971: managerial and administrative, architecture and engineering, elementary and secondary school teaching, clerical, sales and other occupations. This is not altogether surprising

since these were among the largest occupations in 1971, accounting for 63 per cent of total employment at that time.

Most of the persons who had moved out of these six occupation groups were male, but there was some variation in the proportion of female movers by occupation (See Figure VII.6). In general, the proportion of female movers seems to vary with the proportion of females in the occupation so that sex does not appear to be an important predictor of changes in occupation group.

The proportion of persons in different age-groups who had changed occupation group in the period is shown in Figure VII.7 for these six occupation groups. In almost every case, mobility was highest for those under 25, and there was tendency for mobility to fall somewhat as age increased. However, the pattern varied markedly by occupation. For the managerial and administrative occupation group, the proportion who had changed occupation group falls sharply to about age 35 and remains remarkably constant thereafter. By contrast, for the group of architecture and engineering and of elementary and secondary school teaching, the proportion rises with age after an initial decline for the youngest age-group. This may be due to the increasing promotion of persons in these occupation groups into managerial and administrative positions as they become older and more experienced.

For both clerical and sales occupations, there was a fairly consistent decline in mobility with age; by contrast the proportion who had moved out of the "other" occupations category remained fairly constant over all age-groups. For clerical, sales and other occupations, mobility was considerably higher at all ages than for the managerial, engineering and teaching groups. This is not surprising since a degree is not normally required in the three former occupation groups so that degree-holders in them will probably be highly motivated to change occupations.

Occupational mobility also varied considerably by major field of study (see Figure VII.8). For example, less than 20 per cent of those whose major field of study was in education or social science fields had moved out of the managerial and administrative occupation group by 1973; by contrast, the figure for those who had specialised in fields in agriculture or biological science was 39 per cent. As is to be expected, there is a tendency for mobility to be higher for fields of study not closely associated with a particular occupation. For example, as noted in Chapter VI, only a small proportion of managers and administrators had specialised in health fields: mobility out of this occupation group was high for specialists in such fields. Similarly, mobility out of architecture and engineering occupations was highest for persons whose highest degree was in a field other than architecture and engineering.

The proportion of persons who had moved out of clerical, sales and other occupations was considerably greater than that for those who had moved out of the other three occupation groups in almost all fields of study. It is also generally true that the proportion who had left clerical, sales and other occupations was higher for fields of study associated with particular occupations than for those not so related. Thus, for example, mobility was higher for specialists in education than for persons with general arts and science degrees, in all clerical, sales and

other occupations. In other words, persons with specific alternative employment opportunities were more likely to move out of these three occupations.

It is also interesting to examine the distribution of movers from these six selected occupations by occupation of in-mobility. The charts in Figure VII.9 include only the most important occupations of in-mobility; thus, an occupation is included in the chart for the selected occupation only if at least 10 per cent had moved to the new occupation. A large proportion of the movers from a given occupation had in fact moved to one or more of the other occupation groups discussed above. For example, nearly 60 per cent of those who had left the managerial and administrative occupation group had moved to architecture and engineering, or school teaching, or clerical or sales or other occupations. Thus these occupations were occupations not only of high out-mobility but also of high in-mobility.

The managerial and administrative occupation category was the most popular group for in-mobility by persons outside this group in 1971. For example, nearly one-third of the movers who were employed as school teachers in 1971 had moved to managerial and administrative occupations in 1973. This is not surprising since such moves probably reflect promotions as age and experience increase.

Conclusions

Data on the changes in occupation made by degree-holders in the approximate period 1971-1973 were examined in this chapter. Roughly 45 per cent of persons who were employed in both 1971 and 1973 had moved to a different detailed occupation in 1973. Most of these changes occurred between the twenty occupation groups listed in Appendix II; some 32 per cent had changed occupation group.

These figures are extremely high, suggesting that many degree-holders are highly flexible in terms of the functions they perform. Occupations are defined in terms of work functions, so that the fact that many degree-holders had changed occupation indicates that the skills they develop and their personal attributes are applicable to a wide variety of jobs.

These results are also consistent with the analysis in Chapter VI which suggests that there is, in many cases, only a loose association between occupation and field of study. It therefore casts further doubt on the validity of the manpower forecasting approach as a basis for planning enrolments in the university sector.

Some of the factors which affect occupational mobility were also explored in this chapter. Age, type of degree and field of study seemed to be related to occupational mobility, but the importance of sex and province of residence were less apparent. Persons who had changed province of residence or who had upgraded their education were more likely to have changed occupation as well, but the numbers involved were fairly small in both cases.

Occupation of employment also appears to be an important determinant of occupational mobility, and most of the persons who had changed occupation had moved out of six occupation groups: managerial and administrative, architecture

and engineering, elementary and secondary school teaching, clerical, sales and other occupations. It is interesting to note that the latter three (clerical, sales and other) had a higher rate of out-mobility than all other occupational groups except service occupations. These three groups were classified in Chapter VI as "non-degree-oriented" occupations, that is, those in which a degree does not appear to be a requirement for employment. The high out-mobility from these groups is thus consistent with the view that degree-holders will tend to move out of occupations in which their education may not be relevant.

In some cases, the occupation group of highest in-mobility was the managerial and administrative group. This suggests that some changes in occupation are, as to be expected, part of the normal career development of the individuals concerned.

The conclusions here are fairly general, and more detailed analysis of the data is clearly necessary before specific conclusions can be drawn. As noted in the introduction to this chapter, data on changes in occupation may be used to provide a better understanding of career ladders and their implications for educational policy. Similarly, these data may be used to provide estimates of the net losses to various occupations through mobility. These may then be combined with estimated losses through mortality and retirement to provide better estimates of the jobs becoming available and hence better information for manpower counselling and guidance.

It has not been possible to carry out such detailed analyses in this general report. However, it is hoped that other researchers will be encouraged by the analysis here to explore the data base in order to carry out a more detailed investigation of occupational mobility.

FIGURE VII.1 Occupational change 1971-73 by age and sex (based on 20 occupation groups in Appendix II)

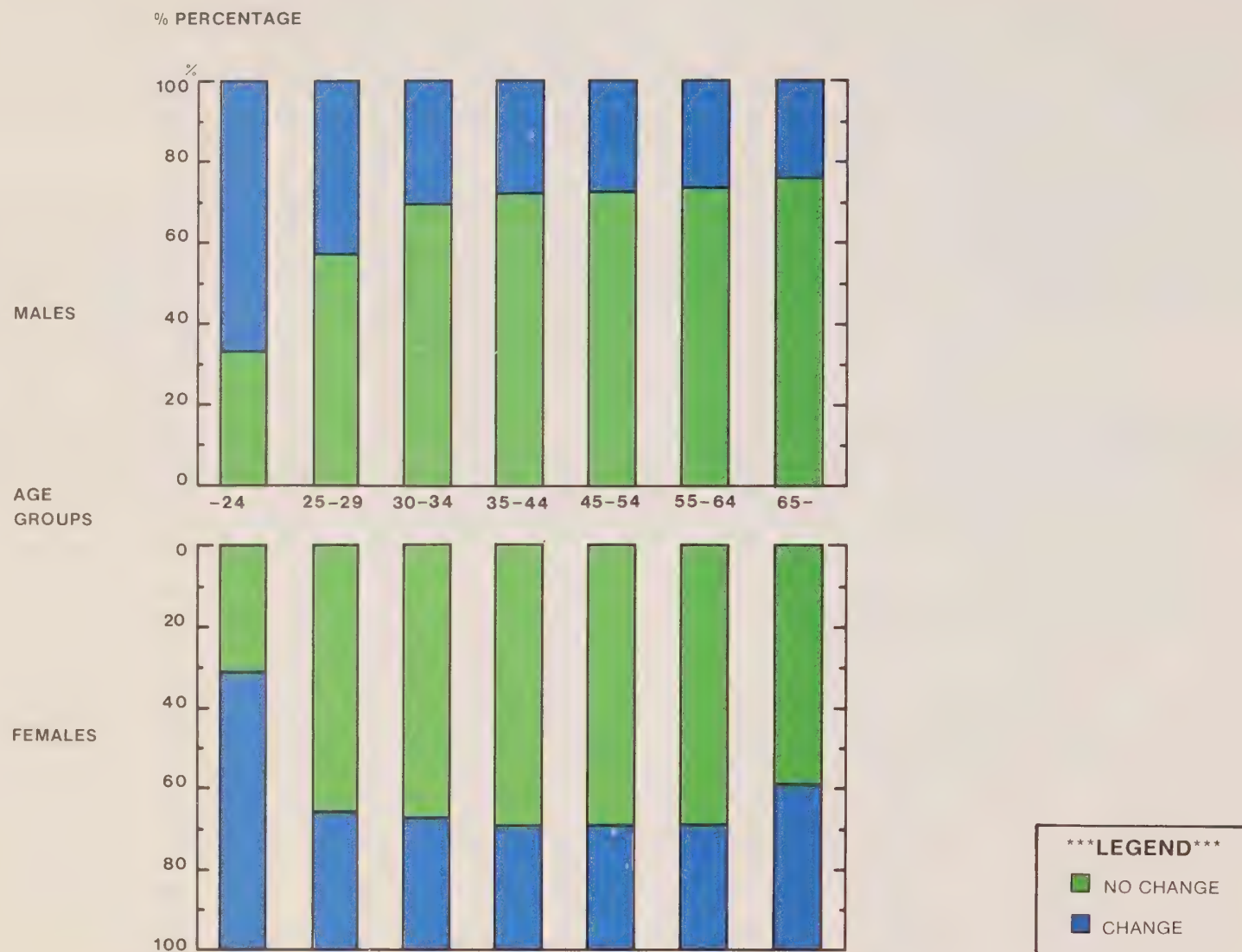


FIGURE VII.2 Occupational change 1971-73 by province of residence (based on 20 occupation groups in Appendix II)

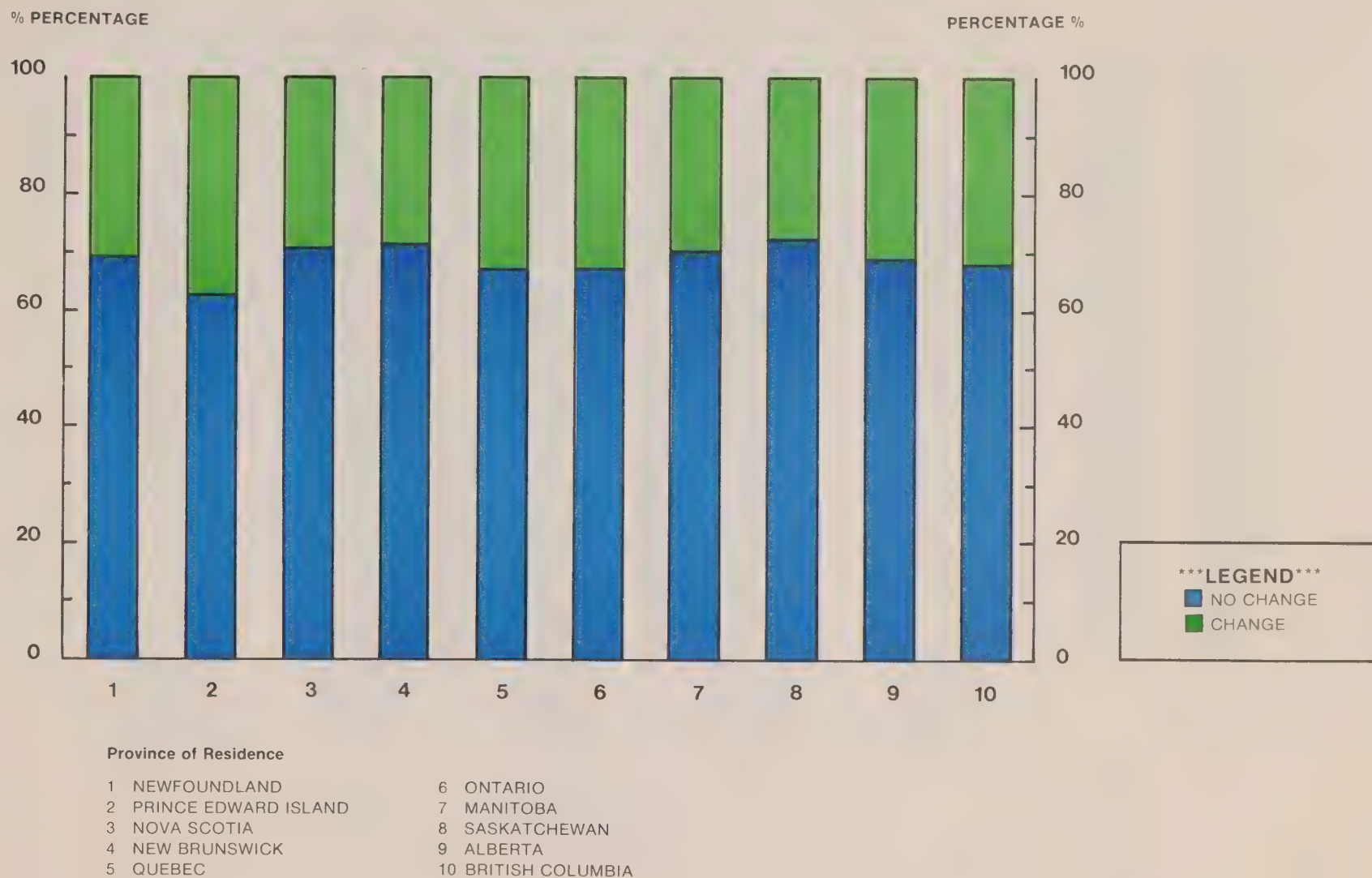


FIGURE VII.3 Occupational change 1971-73 by major field of study (based on 20 occupation groups in Appendix II)

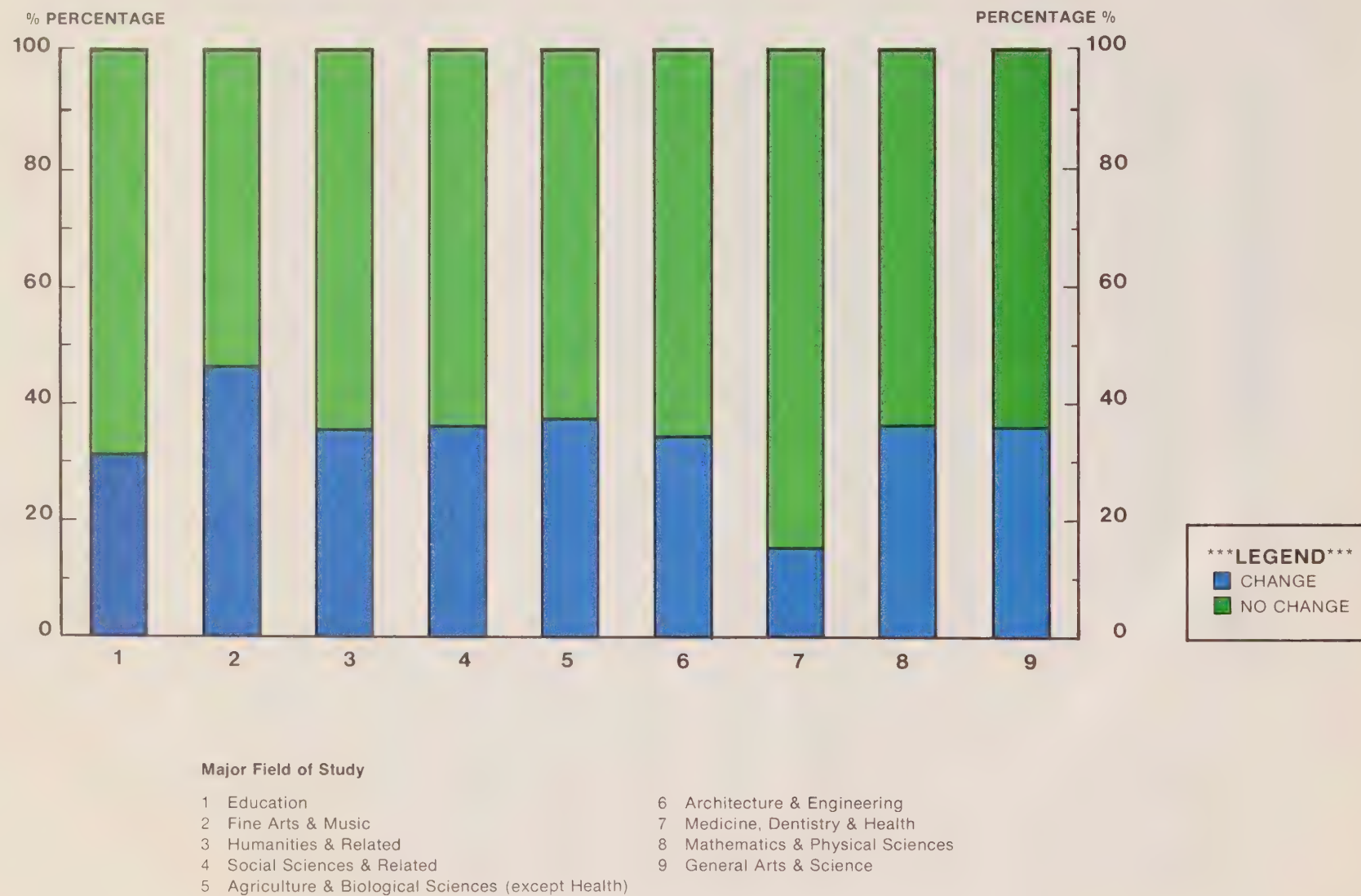


FIGURE VII.4 Occupational change 1971-73 by type of degree (based on 20 occupation groups in Appendix II)

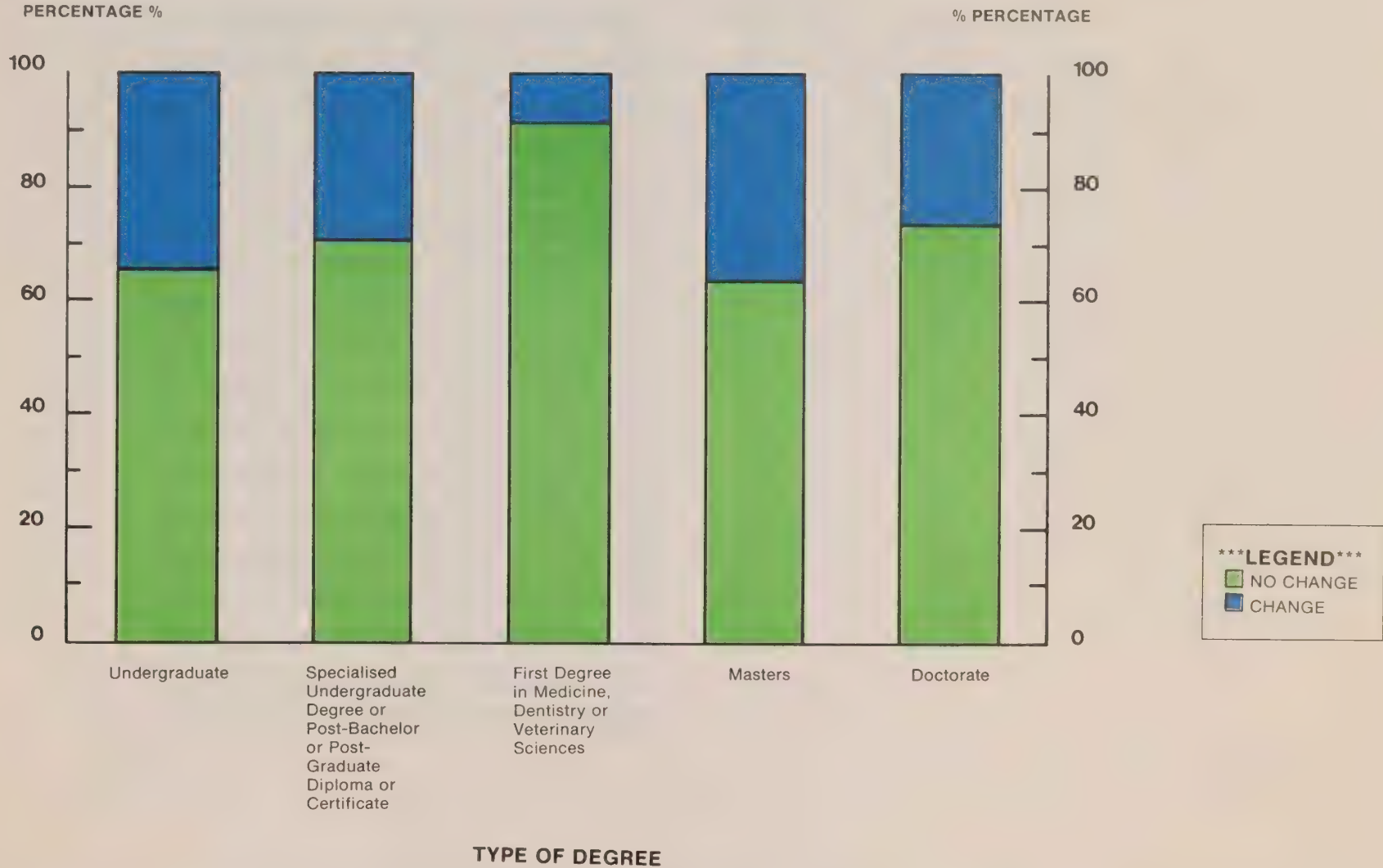


FIGURE VII.5 Occupational mobility 1971-73, by occupation group.

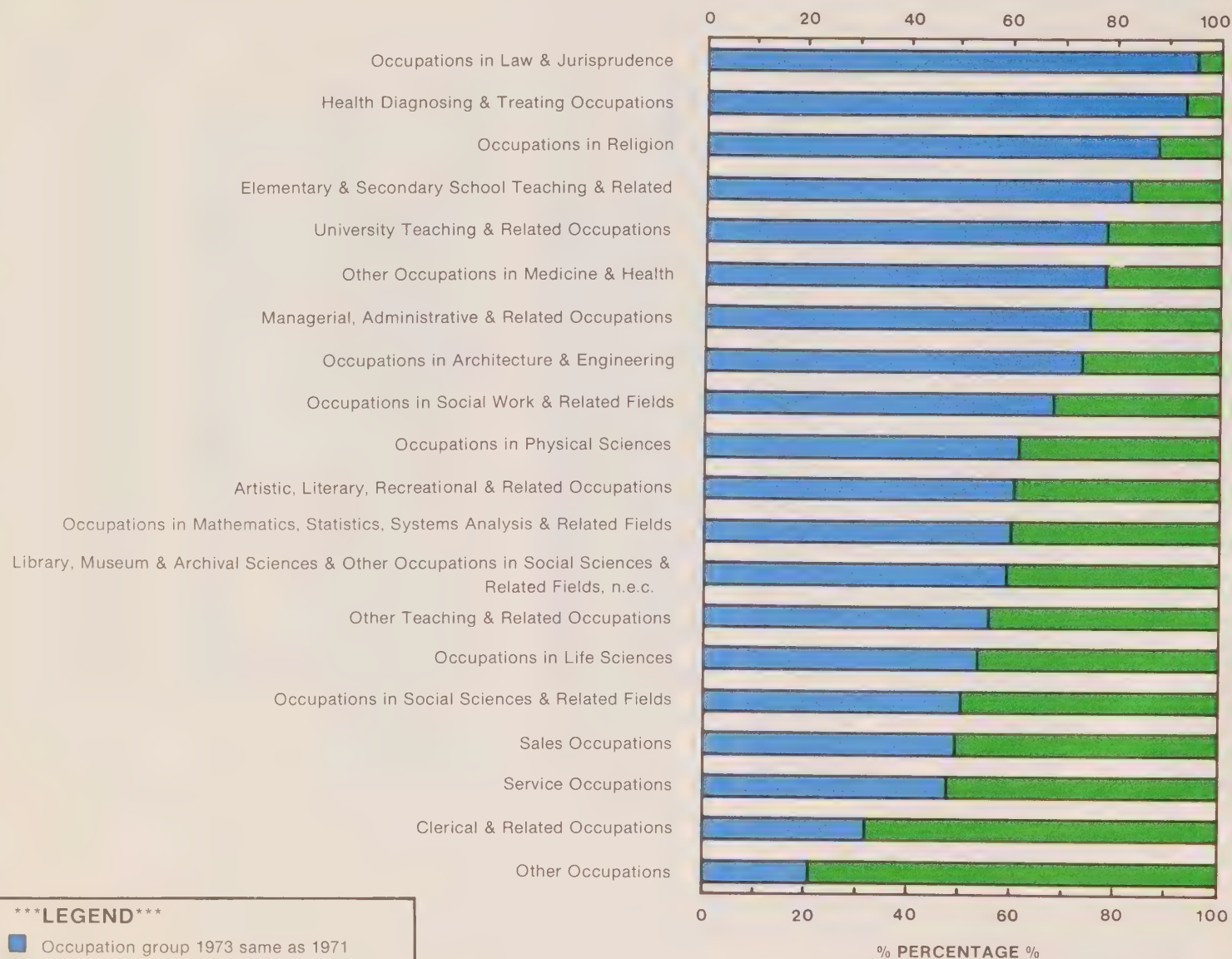


FIGURE VII.6 Sex distribution of persons in selected occupation groups who had changed groups in 1971-1973

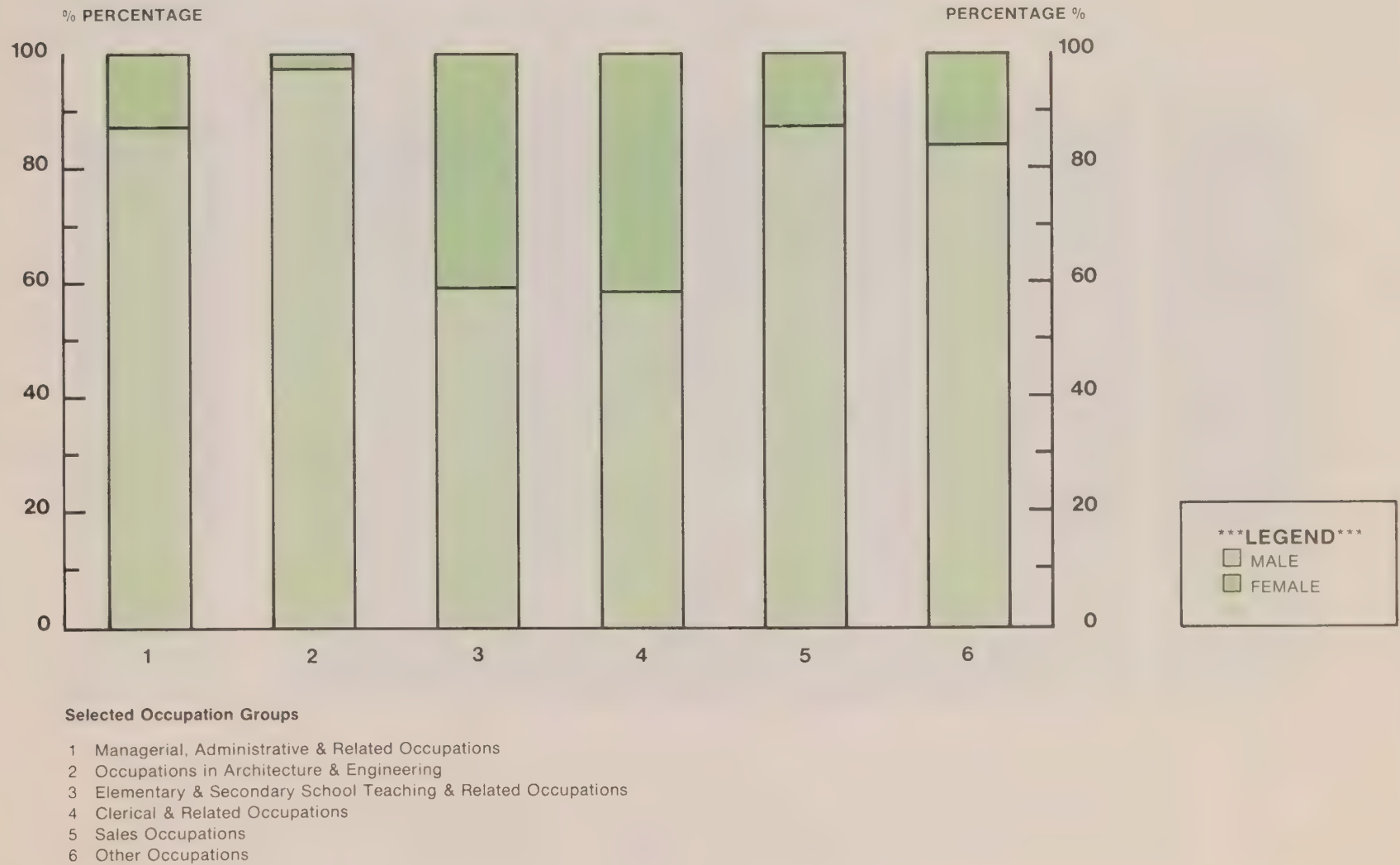


FIGURE VII.7 Proportion of persons who changed occupation in 1971-73, by age for selected occupations

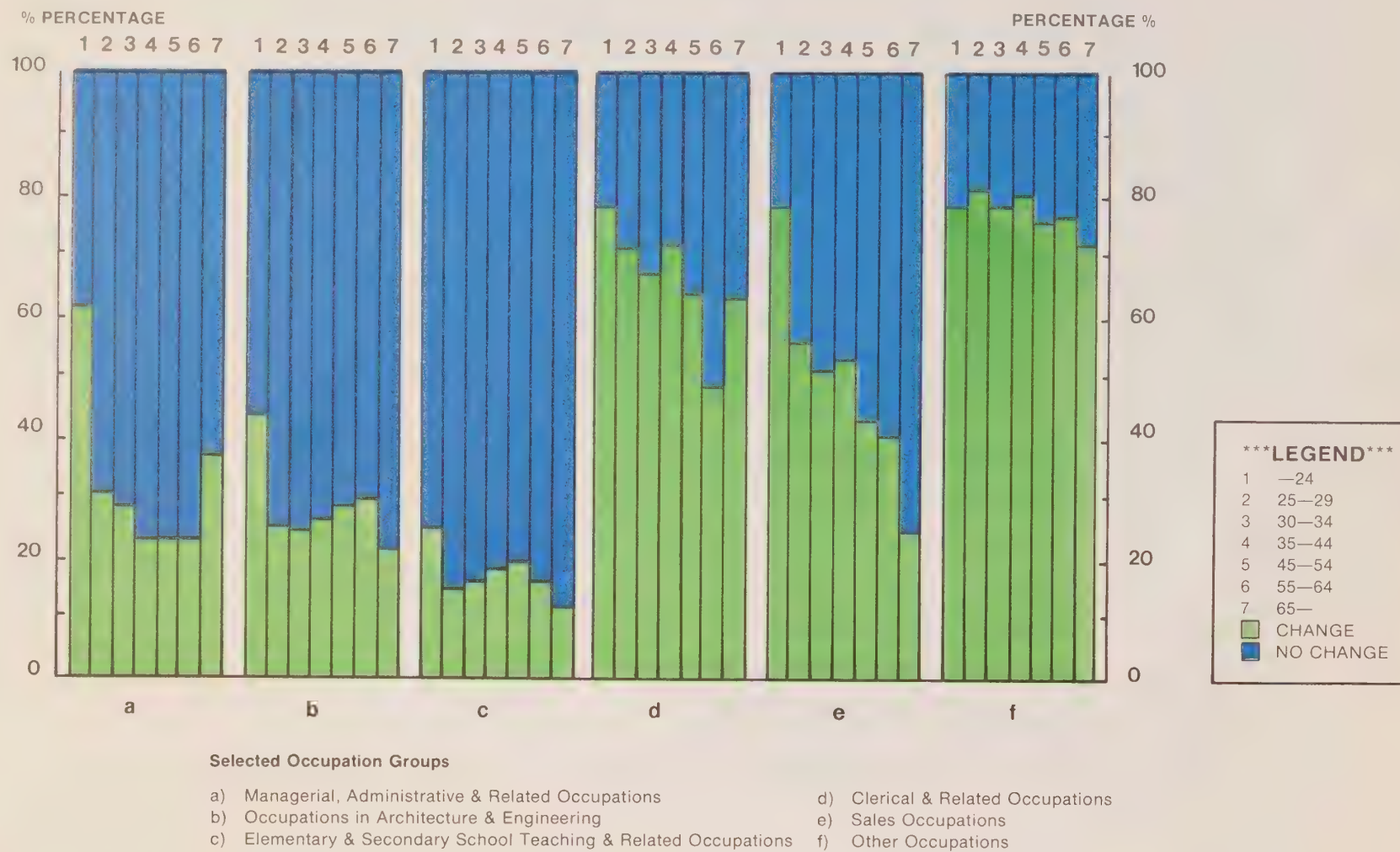


FIGURE VII.8 Occupational change 1971-73, by field of study, for selected occupation groups

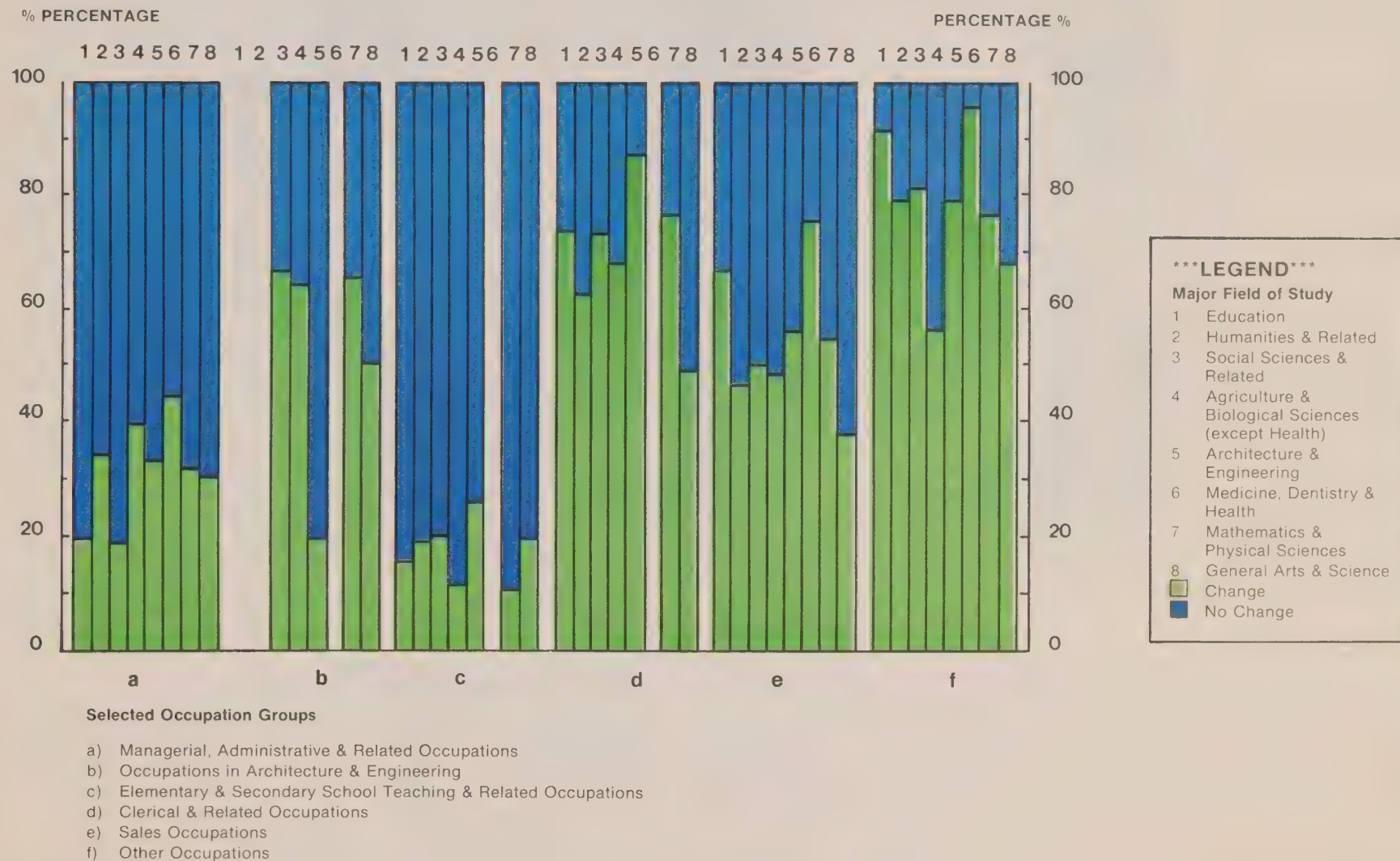
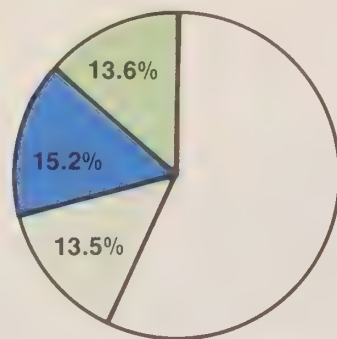
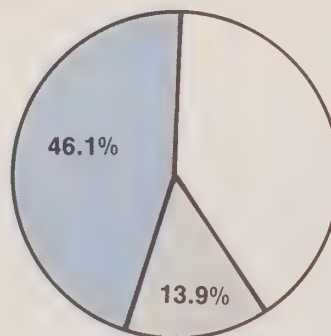


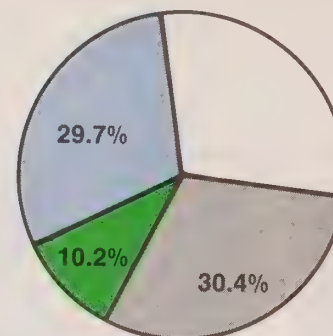
FIGURE VII.9 Distribution of persons who moved out of selected occupation groups by occupation group of in-mobility (1971-1973)



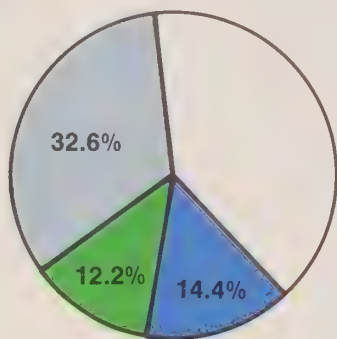
(a) Managerial, Administrative & Related Occupations



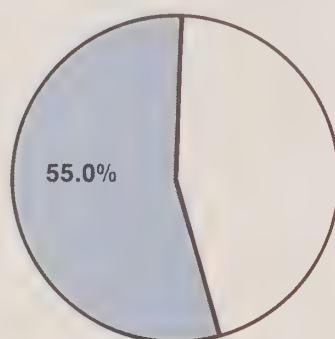
(b) Occupations in Architecture & Engineering



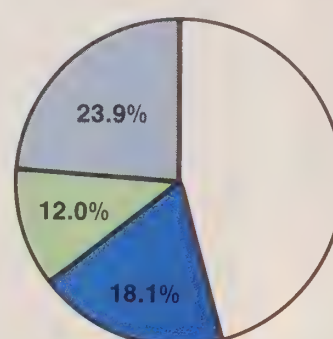
(c) Elementary & Secondary School Teaching & Related Occupations



(d) Clerical & Related Occupations



(e) Sales Occupations



(f) Other Occupations

LEGEND

OCCUPATION GROUPS OF IN-MOBILITY

Managerial, Administrative & Related Occupations	Other Teaching & Related
Occupations in Architecture & Engineering	Sales Occupations
Occupations in Library, Museum & Archival Sciences & Other Occupations in Social Sciences & Related Fields, n.e.c.	Other Occupations
Elementary & Secondary School Teaching & Related Occupations	Occupations not specified here

Chapter VIII

Geographic Mobility

Introduction

This chapter is concerned with the geographic mobility or migration of degree-holders in Canada. Data were collected in the 1971 census on the province or country in which degree-holders had completed their secondary schooling, and in the 1973 Highly Qualified Manpower Survey on the province or country in which they had taken their first and their highest degrees, and on the province or country in which they were working at different times in their career. Thus these data provide a basis for analysing the geographic movements made by degree-holders at different points in their lives.

These geographic movements reflect the effects of a number of different factors. For example, some degree-holders immigrated to Canada, and they would have taken some of their education or would have spent some time working outside this country. Similarly, many of those who completed their secondary schooling in Canada would have taken their first or highest degree in a different province, because of the availability of university places in their chosen program of study or because of personal or family reasons. After graduation, some would also have changed province for personal reasons; others would have responded to provincial differences in incomes, employment opportunities, and other such factors. Such movements may be particularly high for graduates since they are usually well-informed about labour market conditions in other parts of the country, and they are often in a better financial position to meet the costs of both looking for a job and changing residence.

The migration of degree-holders often poses difficult problems for policy-makers. University education is expensive and, although part of the cost is borne by students, many universities rely on public funds for the bulk of their revenue. In Canada, public funds are directly provided mainly by provincial governments and indirectly by the federal government through tax transfers to the provincial governments. It follows that a high level of net out-migration of graduates from a province may be a cause of concern to the government of that province, since the economic benefits of its investment in the education of such migrants will be lost to it. These losses could be particularly important if there were both a shortage and net out-migration of particular degree-holders, in which case the

performance of the provincial economy could be seriously affected. It should be noted, however, that the net out-migration of degree-holders in excess supply could yield economic benefits, such as lower unemployment, which could have a substantial beneficial effect on the provincial economy. Thus, the effects of the migration of degree-holders may not be easily determined.

The following section of this chapter provides some data on the basic patterns of migration of degree-holders. Comparisons are made between province of secondary school completion and of first degree, between province of first degree and of highest degree, and between province of highest degree and of employment in 1973. The next section deals with a description of some of the characteristics of persons who took their highest degree inside and outside their province of employment in 1973. This is followed by a similar description for degree-holders who completed their secondary schooling and took their highest degree in Canada. Some of the conclusions of the analysis are discussed in the final section of the chapter.

It will be clear from the above outline that although the migration patterns and characteristics of immigrants are important, they have not been identified as a group for separate analysis in this report. This is because the focus of attention here is on the internal migration of degree-holders and on some of its implications for educational policy in Canada.

Basic Patterns of Migration

Province of secondary school completion provides a basic reference point for analyzing the migration patterns of degree-holders. Stone [35] has shown that internal migration in Canada varies considerably by age and that migrants tend to be concentrated in the 20-39 age range. Since the parents of secondary school graduates fall mainly outside this age range, migration immediately after secondary school will not generally be the result of migration of the parents of students. Thus it can be assumed that in most cases a difference in province of secondary school graduation and province of first degree represents a change generated by factors such as the student's personal goals and the availability of university places. That this is indeed a reasonable assumption is borne out by

data from a recent study on post-secondary students (see [13]).

The data in Figure VIII.1 show the proportion of degree-holders who took their first degree, and the proportion of those who were employed in 1973, in the province of their secondary school completion. Roughly 90 per cent of those who had completed their secondary schooling in Quebec, Ontario and British Columbia had stayed in the same province to complete their first degree. The figures for the other provinces were somewhat lower, and only 60 per cent in Newfoundland and 40 per cent in Prince Edward Island had stayed on in the same province to do their first degree. This is not surprising since only a limited range of university programs were offered in those provinces until recent years: thus, many of those who had completed their secondary schooling in Newfoundland and Prince Edward Island would have had to leave those provinces simply to take the degree they had chosen. Many chose to go to Nova Scotia where the availability of university programs has been higher: thus 21 per cent of those in Newfoundland and 22 per cent of those in Prince Edward Island took their first degree in Nova Scotia.

The proportion employed in 1973 in the province of secondary school graduation also varied considerably by province. Here again the highest proportions (80-90 per cent) were for Quebec, Ontario and British Columbia. The proportions were somewhat lower for the Maritime and Prairie provinces. This was particularly true for Saskatchewan: only 42 per cent of those who had completed their secondary schooling in that province were working there in 1973.

As might be expected, a substantial proportion of those who had completed their secondary schooling in a province other than Ontario were employed in Ontario in 1973 (Table VIII.1). For example, roughly 20 per cent of persons who completed their secondary schooling in Nova Scotia, New Brunswick or Manitoba were employed in Ontario in 1973.

Table VIII.1 Percent of degree-holders who completed secondary schooling in a given province working in Ontario in 1973

Province of Secondary School Completion								
NFLD	P.E.I.	N.S.	N.B.	QUE	MAN	SASK	ALTA	B.C.
9.4	18.0	20.0	19.7	10.5	19.8	16.3	9.6	11.2

It is also interesting to compare the proportion of secondary school graduates in each province who took their first degree there, with that for those who were employed there in 1973 (Figure VIII.1). Newfoundland and Prince Edward Island were the only provinces in which the proportion employed in 1973 in the province of secondary school graduation exceeded the proportion who took their first degree in that province. This indicates that for these two provinces a large proportion of persons returned there after completion of their university education; as noted above, this is probably due to the limited range of university programs offered in those provinces until recent years. This pattern is markedly different from that for the other provinces: many individuals appeared to stay in their home province for their university education and to move out for their

employment. This post-degree migration was greatest for Manitoba and Saskatchewan.

These patterns can be examined more closely using data on migration between province of first degree and of highest degree, and between province of highest degree and of employment. These data may be used to study the movements graduates made in obtaining a higher degree and in finding jobs after graduation.

Quebec and Ontario had the highest proportions (roughly 80 per cent) of first-degree holders staying in the same province for their highest degree (Figure VIII.2). In both cases the proportion was lower than that for secondary school graduates who stayed there for their first degree (compare Figure VIII.1), thus indicating that migration increases after the first degree level.

A substantial proportion of those who had taken their first degree in a province other than Quebec or Ontario tended to move to Ontario, and to a lesser extent to Quebec, for their highest degree (Table VIII.2). This is not surprising in view of the wider range of graduate programs available in these two provinces.

Table VIII.2 Percentage of persons who took first degree in a particular province, with highest degree from Quebec or Ontario*

Province of highest degree	Province of first degree									
	NFLD	PEI	NS	NB	QUE	ONT	MAN	SASK	ALTA	B.C.
Quebec	3.5	61.7	8.0	14.5	—	4.3	3.0	4.0	2.6	4.0
Ontario	8.7	10.3	11.5	12.5	9.0	—	11.0	13.5	9.1	13.0

(*) Covers only persons with more than one degree.

Figure VIII.3 shows the proportion of persons who took their highest degree in a given province and were working there in 1973. The highest proportion (nearly 90 per cent) was for Newfoundland, but the proportion was also very high for Quebec, Ontario and British Columbia. The proportion was considerably lower for the other provinces, and slightly more than half of those who took their highest degree in New Brunswick were working elsewhere in Canada. Most of those who had moved were working in Ontario. For example, 18 per cent of those who had taken their highest degree in Nova Scotia were working in Ontario in 1973; for New Brunswick the figure was 20 per cent.

The net inflows and outflows of degree-holders are shown for each province in Figures VIII.4 and VIII.5. The net inflow between province of secondary school completion and province of first degree is defined as the difference between the number who took their first degree in a particular province and the number who completed their secondary schooling there; thus, the net inflow equals the net additional number of individuals who came from outside the province for their first degree. Likewise, a net outflow indicates the net number of persons who left the province for their first degree. The net inflows and outflows between province

of highest degree and province of employment in 1973 are defined in a similar way.

The figures for the net inflows and outflows between province of secondary schooling and province of first degree (Figure VIII.4) reveal some surprising patterns. The size of the net flow varies considerably by province. It was largest for Quebec and Saskatchewan: eight thousand more degree-holders had moved into than out of Quebec, and seven thousand more had left than had entered Saskatchewan. The net flow represents a fairly small proportion of the first degrees granted in Quebec (6%) but a relatively large proportion of those granted in Saskatchewan (75%). The net flows out of Newfoundland and Prince Edward Island were fairly small, but they represented 56 per cent and 87 per cent respectively of the first degrees granted there. As noted previously, secondary school graduates in these two provinces have been highly dependent on the educational facilities in other provinces for their degrees.

The figures for Ontario are interesting since the net flow was relatively small despite the fact that the largest number of first degrees had been obtained there. This suggests that although a large number of persons had moved into Ontario to obtain their first degree, an almost equal number of secondary school graduates in Ontario had left the province to get their first degree.

The graphs in Figure VIII.4 also show internal and external flows separately. The former include only migration flows within Canada while the latter include flows from and to the rest of the world. External flows were generally small except in the case of Quebec: six thousand more degree-holders had moved into than out of Quebec to obtain their first degree. Most of the outflow from Saskatchewan went to the other provinces; by contrast, most of the outflow from Alberta was to other countries.

The flows between province of highest degree and province of employment in 1973 (Figure VIII.5) also show wide provincial variation. In numerical terms, 56 thousand more degree-holders had moved into than out of Ontario for their jobs in 1973. Although much of this net inflow consisted of persons who had obtained their degree outside Canada, 10 thousand had in fact obtained their highest degree from one of the other provinces. Quebec, Alberta and British Columbia also had substantial net inflows and these were also largely from outside Canada. It is interesting to note that nearly three thousand more had left than had entered Quebec from the other provinces. Thus although Quebec gained substantially in terms of the net in-migration of degree-holders from outside Canada, it lost a significant number to the rest of Canada.

In terms of movements within Canada, net outflows also occurred from Nova Scotia, New Brunswick, Manitoba and Saskatchewan. These four provinces also had a substantial net inflow from outside Canada which clearly helped to reduce the impact of the internal movements on the number of degree-holders employed in those provinces.

Migration status of employed degree-holders

It is clear from the analysis in the preceding section that there has been a substantial amount of geographic mobility of degree-holders in Canada both before and after they obtain their degree. This suggests that the supply of manpower in each province has been significantly affected by the availability of education facilities both in other provinces and outside the country. For Canada as a whole, slightly more than one-third of the degree-holders employed in a given province had received their highest degree outside that province, but the importance of out-of-province degrees varies considerably by province. For example, only about one-quarter of those employed in Quebec, but nearly two-thirds of those in Prince Edward Island, had obtained their highest degree outside the province (Figure VIII.6).

The reasons for this wide provincial variation are probably quite different. For example, in Prince Edward Island, nearly 30 per cent of those employed in 1973 had taken their secondary schooling there but their highest degree outside the province; as noted earlier, this is due partly to the limited range of courses offered in the province which makes the economy highly dependent on out-of-province graduates. For Quebec, the availability of a relatively large number of programs and places, as well as the cultural and linguistic differences with the rest of Canada, have probably contributed to its dependence on its own graduates.

It is interesting to note that only 25 per cent of the degree-holders employed in Quebec as opposed to 35 per cent of those in Ontario had obtained their highest degree outside the province. As noted in the preceding section, both provinces had roughly the same rates of retention of their own students but very different in-migration flows, particularly from outside Canada. This suggests that Quebec has been more highly dependent on the inflow of foreign degree-holders as a source of labour supply than Ontario.

As would be expected, age appears to play an important part in the migration of individuals (Figure VIII.7). The proportion of persons who received their highest degree outside their province of employment in 1973 increases as age increases and remains fairly steady after about age 35: this suggests that mobility increases up to age 35 and remains constant thereafter. This is not surprising since younger persons are more likely than older persons to change province because of the effects of such factors as marital and family status. In addition, the younger age-groups include a higher proportion of persons taking a second degree and some of these would probably change province on completing their higher degree. Finally, the effects of migration from outside Canada would also tend to raise the proportion educated outside the province for the older age-groups.

The proportion of persons who received their highest degree outside their province of employment in 1973 also varied substantially by type of degree (Figure VIII.8). As might be expected, it was lowest for persons with undergraduate degrees: less than one-third of these had received their degree outside their province of employment. The proportion increases by level of degree and more than three-quarters of persons with a doctorate had received their

highest degree outside their province of employment in 1973.

This is not too surprising since persons with a doctorate were often employed in research-oriented or university teaching occupations, and employment opportunities in such occupations have been somewhat concentrated in particular provinces. The mobility of persons with a doctorate has also been fairly independent of major field of study (Figure VIII.9).

The importance of occupation on migration is shown in Figure VIII.10. For the selected occupation groups shown, the lowest proportions educated inside their province of employment were for university teachers (40 per cent) and for physical scientists (44 per cent), for both of which the proportion of doctorates was substantial (see Chapter IV). By contrast the proportions were highest for lawyers (83 per cent) and school teachers (81 per cent), both of which had a relatively high proportion of undergraduate or first professional degrees, and both of which are subject to provincial licensing and control which may make migration difficult.

The migration of Canadian-educated degree-holders

It is interesting to examine in more detail the interprovincial mobility of degree-holders who received both their secondary schooling and their highest degree in Canada. In doing so, the effects of immigrant degree-holders and of foreign education facilities are held constant, and attention may be focused on the effects of inter-provincial migration on the supply of degree-holders in the various provinces.

In the analysis which follows, degree-holders who were employed in a particular province in 1973 are classified into five groups:

- 1) those who completed both their secondary schooling and their highest degree in that province — these are persons with the least mobility;
- 2) those who completed their secondary schooling in that province but their highest degree in another;
- 3) those who took their highest degree in that province but their secondary schooling in another;
- 4) those who took their highest degree in the same province as that in which they completed secondary school but were working in another; and
- 5) those for whom the province of secondary school completion, highest degree and employment in 1973 were all different — these are persons with the highest mobility.

The data in Figure VIII.11 for migration by province of employment show much the same pattern as those for all degree-holders discussed in the preceding section. Only 37 per cent of those in Prince Edward Island, but 84 per cent of those in Quebec, received all their education in their province of employment in 1973. The figures for the other Atlantic provinces are also somewhat exceeded by those in the other provinces with the exception of Alberta; only 60 per cent of those employed in Alberta had received all their education in that province.

At the other extreme, the proportion of persons employed in Alberta who

received all of their education outside that province was 27 per cent. This is not surprising since Alberta has been a province of high in-migration. The proportion is also high for Prince Edward Island (30 per cent) and fairly substantial for the other Atlantic Provinces. However, these figures may be due to a substantial amount of migration within the Atlantic region rather than high migration from the rest of Canada.

Quebec gained the least in terms of the in-migration of persons educated wholly in Canada but outside the province. Only nine per cent of the degree-holders employed in Quebec had received both their secondary schooling and highest university degree in other provinces. The next lowest proportion was for Saskatchewan, and 12 per cent of degree-holders employed in that province had obtained all of their education in other provinces.

It is simple to derive from Figure VIII.11 the proportion of Canadian-educated persons employed in each province who took their highest degree inside that province. These proportions ranged from 38 per cent for Prince Edward Island to 87 per cent for Quebec, and they are higher than the proportions for all degree-holders discussed in the preceding section: 33 per cent for Prince Edward Island and 75 per cent for Quebec (see Figure VIII.6). This suggests that Canadian-educated degree-holders are less geographically mobile within Canada than persons who received their degree outside Canada.

This is confirmed by the data in Figure VIII.12 which show the migration patterns of Canadian-educated degree-holders by age. The proportion who received their highest degree outside their province of employment falls with age to a minimum of about 75 per cent: this is again higher than the minimum of roughly 60 per cent for all degree-holders discussed in the preceding section (see Figure VIII.7).

At the other extreme, the proportion of persons who received all of their education outside the province in which they were working rises with age and reaches a maximum of about 19 per cent. The majority of these had apparently moved only after their highest degree so that the effect of age may be partly due to the fact that many younger persons had not completed their education.

The pattern of migration also varies substantially by type of degree (Figure VIII.13). Roughly 75 per cent of those with undergraduate degrees but only 47 per cent of those with doctorates had received all of their education in their province of employment. For undergraduate degree-holders, the majority of those who had taken some of their education outside their province of employment had apparently moved only after their highest degree. By contrast, of persons with a doctorate roughly the same proportions had moved at various stages in their career. The proportion of those with doctorates who had received their secondary schooling, received their highest degree, and were working in 1973, all in different provinces, was also much higher than that for other types of degree.

The data in Figure VIII.14 show how the supply of Canadian-educated degree-holders varied by occupation. It is not surprising that service occupations had the highest proportion of persons who received all of their education outside their

province of employment: many degree-holders in this occupation group were in the Canadian Forces so that their province of employment would be determined by their base. School teachers and lawyers had the least mobility and this is probably due to the restrictions on their movement in the form of licensing requirements imposed by governments or by professional associations.

The proportions of Canadian-educated school teachers and lawyers who received all their education outside their province of employment were also smaller than those for all degree-holders in these occupations discussed in the preceding section (see Figure VIII.10). However, the differences are not large, thus indicating the important effects of regulation on the mobility of persons in these occupation groups. By contrast, the difference is substantial for university teachers: 39 per cent of all university teachers but only 25 per cent of those trained in Canada had taken their highest degree outside their province of employment. Thus the supply of university teachers has been significantly augmented by the immigration of degree-holders.

Conclusions

Data on the province in which degree-holders had completed their secondary schooling and their first and highest degree, and in which they were employed in 1973, have been used in this chapter to provide a partial picture of their geographic movements. The analysis showed that roughly 80 per cent of those who had completed their highest degree in Newfoundland, Quebec, Ontario, Alberta and British Columbia were working in the same province in 1973. The figures were much lower for the Maritime Provinces, for Manitoba and for Saskatchewan: roughly 50 to 60 per cent were still working there in 1973.

The absolute numbers of degree-holders who changed province between these points in their career were also examined. Roughly 8,000 more degree-holders entered than left Quebec for their first degree: most of these came from outside Canada. Nearly 7,000 more left than entered Saskatchewan for their first degree and these mainly went elsewhere in Canada. Ontario, British Columbia and Alberta gained substantially from the movement inside Canada of degree-holders after graduation. Ontario, Quebec, British Columbia and Alberta also gained more than other provinces from the immigration of degree-holders into Canada.

As noted in the introduction to this chapter, the out-migration of large numbers of degree-holders trained in a particular province may be of concern to the government of that province. Since a substantial part of the cost of a degree is met from public funds, net out-migration may imply a considerable loss in the potential benefit of such public investment. In these terms, Nova Scotia, New Brunswick, Quebec, Manitoba and Saskatchewan have been net losers to the rest of Canada; but most of their net loss of graduates has been eliminated by their net gain from the immigration of degree-holders trained outside Canada. Thus on the basis of the past situation, it does not seem likely that any province has suffered a substantial total net out-migration of degree-holders.

The relative importance of degree-holders trained outside their province of

employment in 1973 to the total supply of graduates in that province also varied markedly by province. As expected, a relatively high proportion of graduates working in Newfoundland and Prince Edward Island, where the range of university programs has been limited, had not only left the province to take their degrees but had returned there by 1973. Alberta also relied heavily on graduates trained outside the province: nearly 30 per cent of the graduates working there in 1973 had taken all their education in another province. By contrast only eight per cent of the graduates working in Quebec in 1973 had taken all their education in another province.

Looked at from a different perspective, these data show that in Quebec, Ontario, Manitoba, Saskatchewan and British Columbia, at least 75 per cent of the degree-holders working there in 1973 had taken their highest degree in their province of employment. The figures were lower for the Atlantic Provinces and for Alberta.

The proportion of degree-holders trained in a province other than that in which they were employed in 1973 also varied considerably by occupation. Most degree-holders in teaching (excluding university) and law occupations, which are subject to provincial regulation and control, had taken their highest degree in their province of employment in 1973. A substantial proportion of persons in occupations such as architecture and engineering, physical sciences, social sciences and university teaching had taken their highest degree in a province other than that in which they were employed in 1973.

These data demonstrate that degree-holders have been highly mobile, but no systematic attempt has been made here to identify the main reasons for these mobility patterns. Some are fairly obvious. For example, only a limited range of university programs has been offered until recently in Newfoundland and Prince Edward Island, and this would have affected the training of graduates in those provinces. Similarly, linguistic and cultural differences with the rest of Canada have clearly affected the mobility of graduates trained in Quebec, many of whom would have been French-speaking. The booming Alberta economy has exerted a strong pull on graduates so that mobility into that province has been high. Provincial licensing and control of persons in different occupations have also affected the mobility of particular graduates.

The high geographic mobility of degree-holders suggests that a national or inter-provincial perspective is necessary for planning the supply of university graduates. Many graduates have sought their education in different provinces and some have clearly responded to changing labour market conditions at the national level. Immigration into Canada has helped in the past to reduce the potential losses for provinces of out-migration, but there is no guarantee that it will continue to do so in the future.

FIGURE VIII.1 Proportion of degree-holders who took first degree or were employed in 1973 inside and outside province of secondary school completion

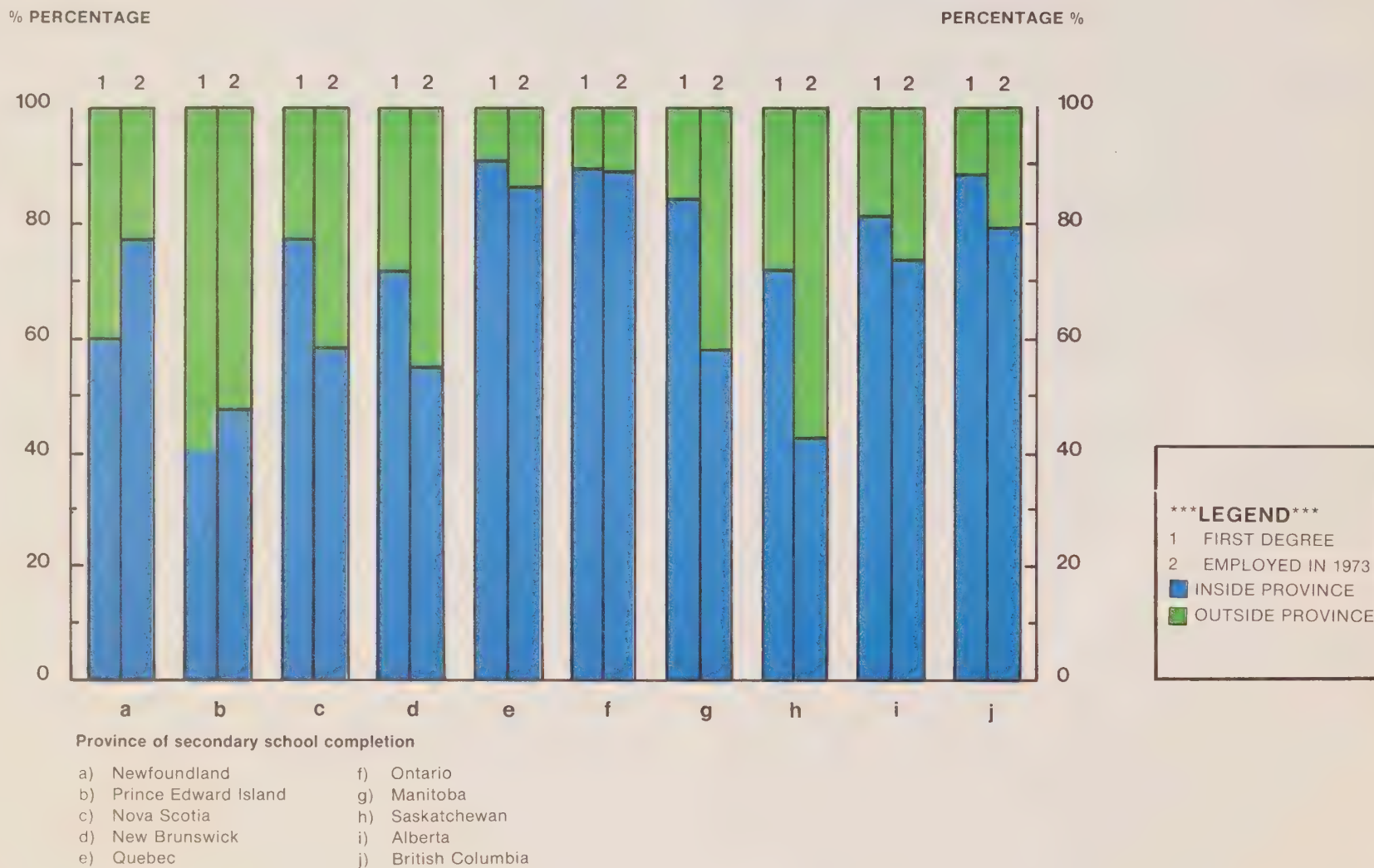


FIGURE VIII.2 Proportion of degree-holders who took their highest degree inside and outside the province of their first degree

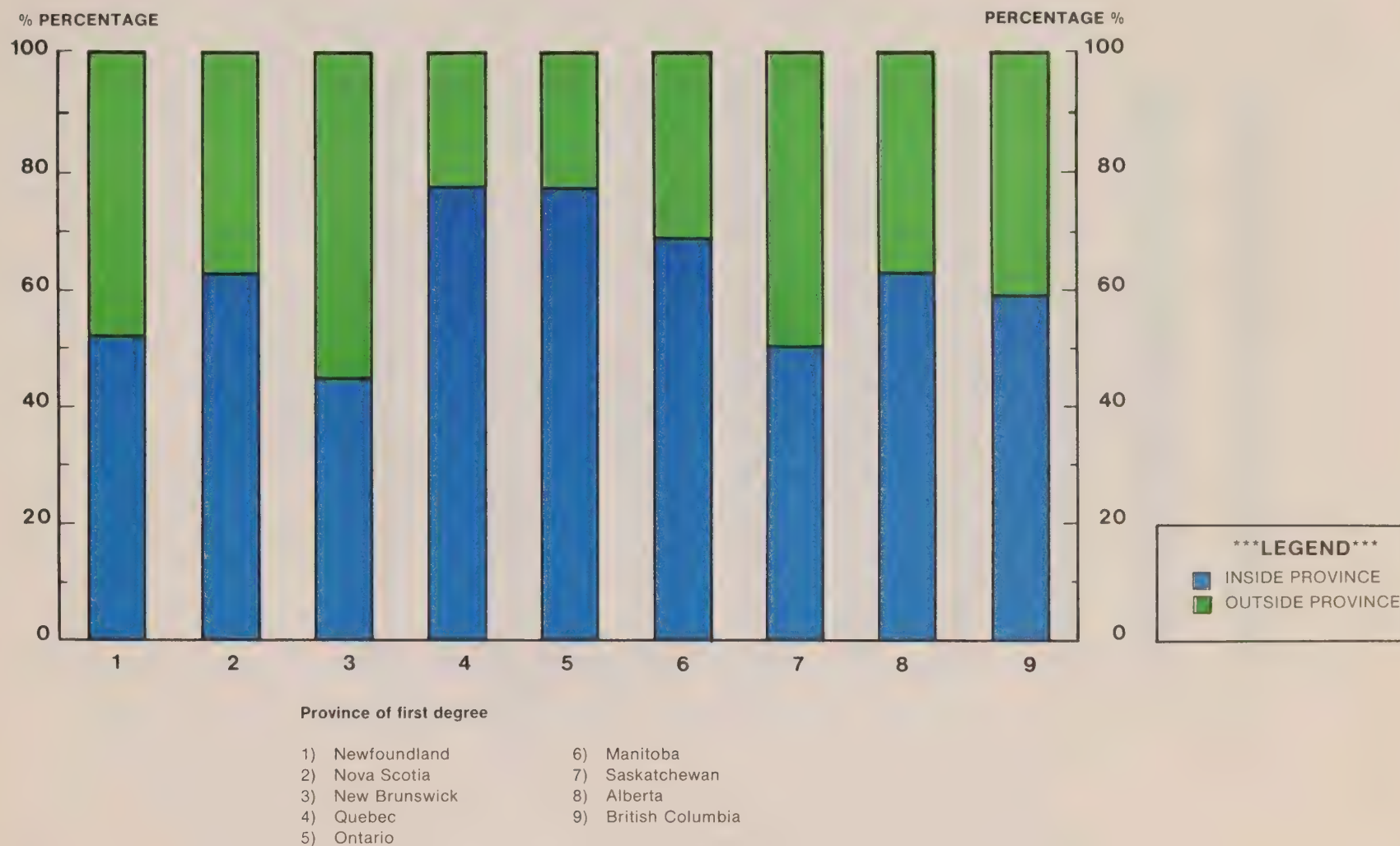


FIGURE VIII.3 Proportion of degree-holders employed in 1973 inside and outside province of highest degree

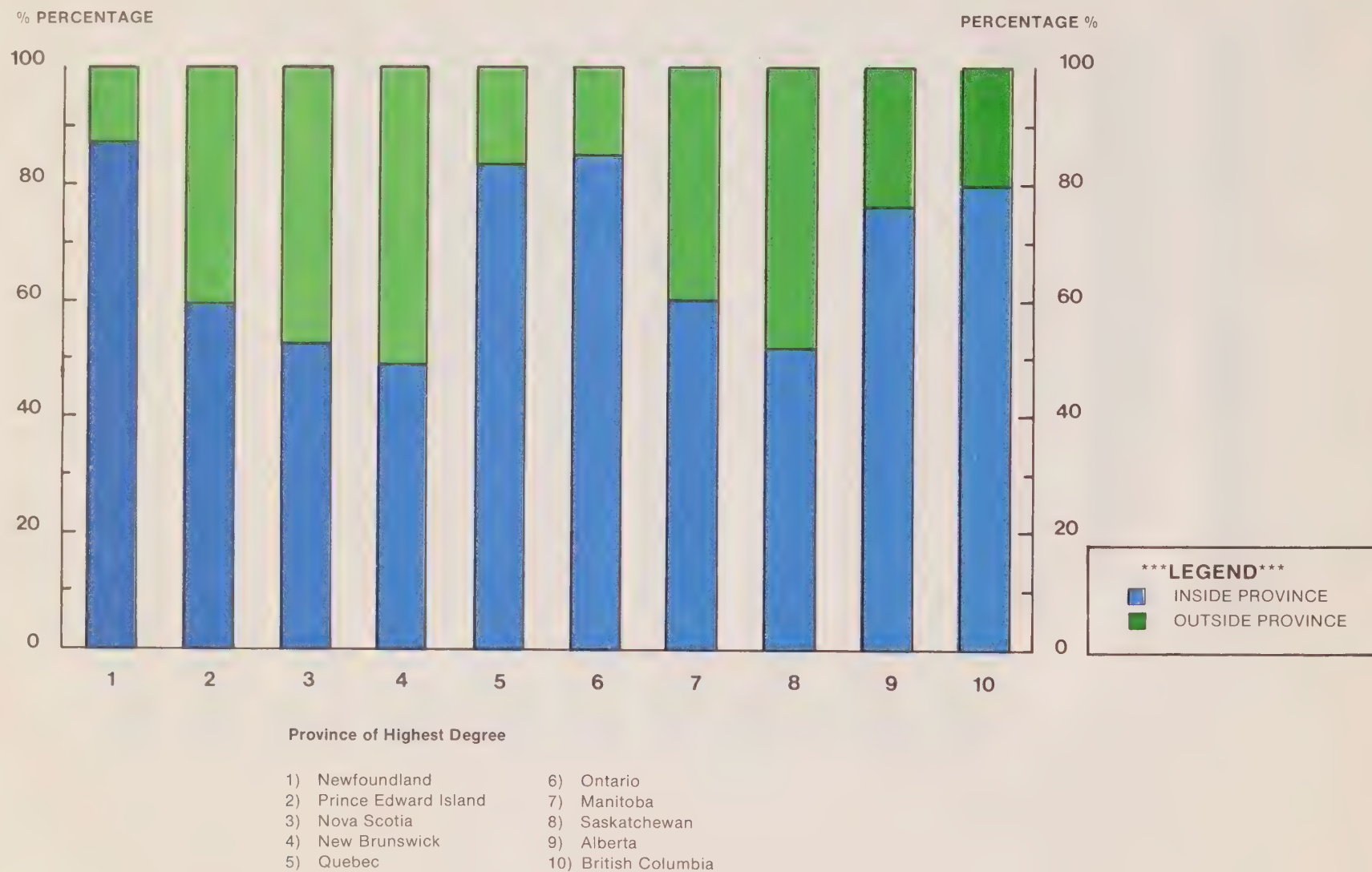
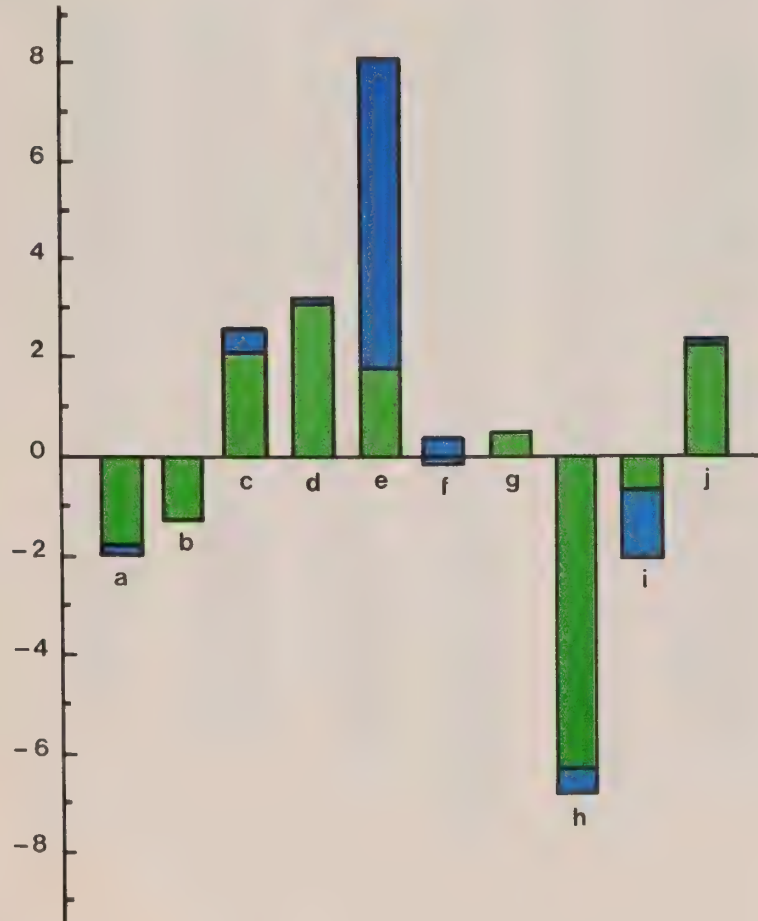


FIGURE VIII.4 Net inflows (+) and outflows (-) between province of secondary school completion and province of first degree (000's)

THOUSAND



Province

- a) Newfoundland
- b) Prince Edward Island
- c) Nova Scotia
- d) New Brunswick
- e) Quebec
- f) Ontario
- g) Manitoba
- h) Saskatchewan
- i) Alberta
- j) British Columbia

*****LEGEND*****

- INTERNAL (WITHIN CANADA)
- EXTERNAL (OUTSIDE CANADA)

FIGURE VIII.5 Net inflows (+) and outflows (-) between provinces of highest degree and province of employment in 1973 (000's)

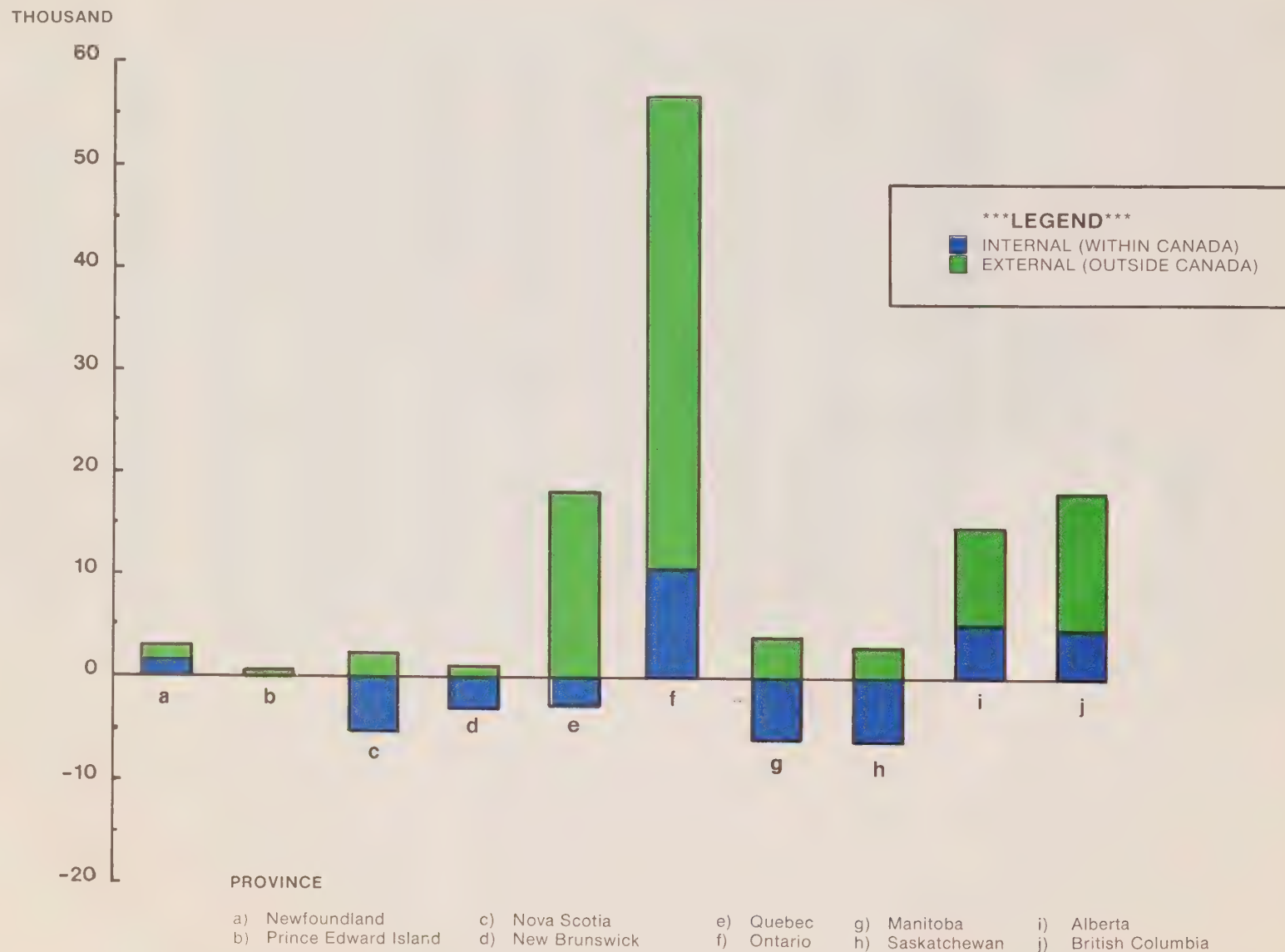


FIGURE VIII.6 Proportion of degree-holders who took highest degree inside and outside province of employment in 1973, by province

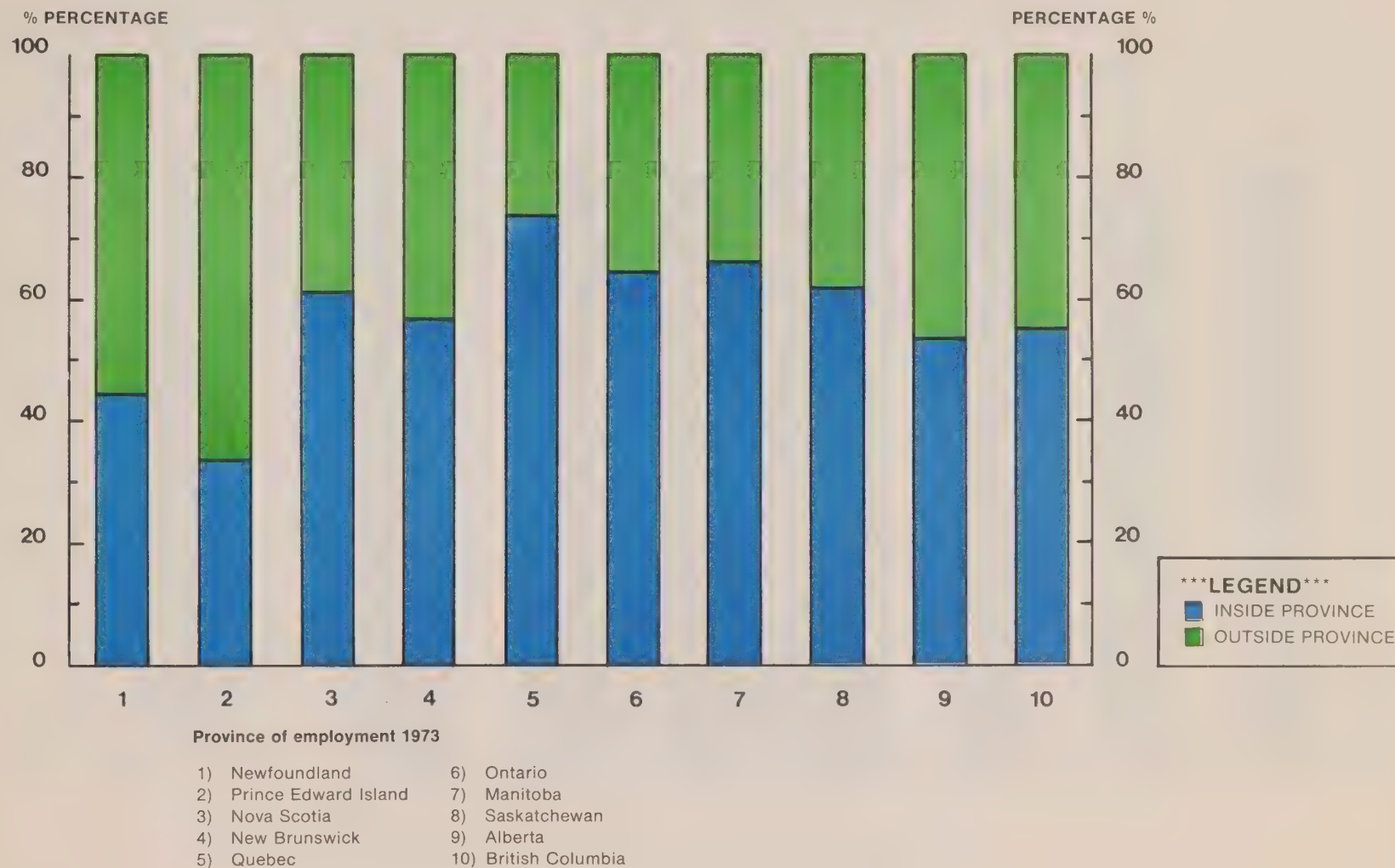


FIGURE VIII.7 Proportion of degree-holders who took highest degree inside and outside of province of employment in 1973, by age-group

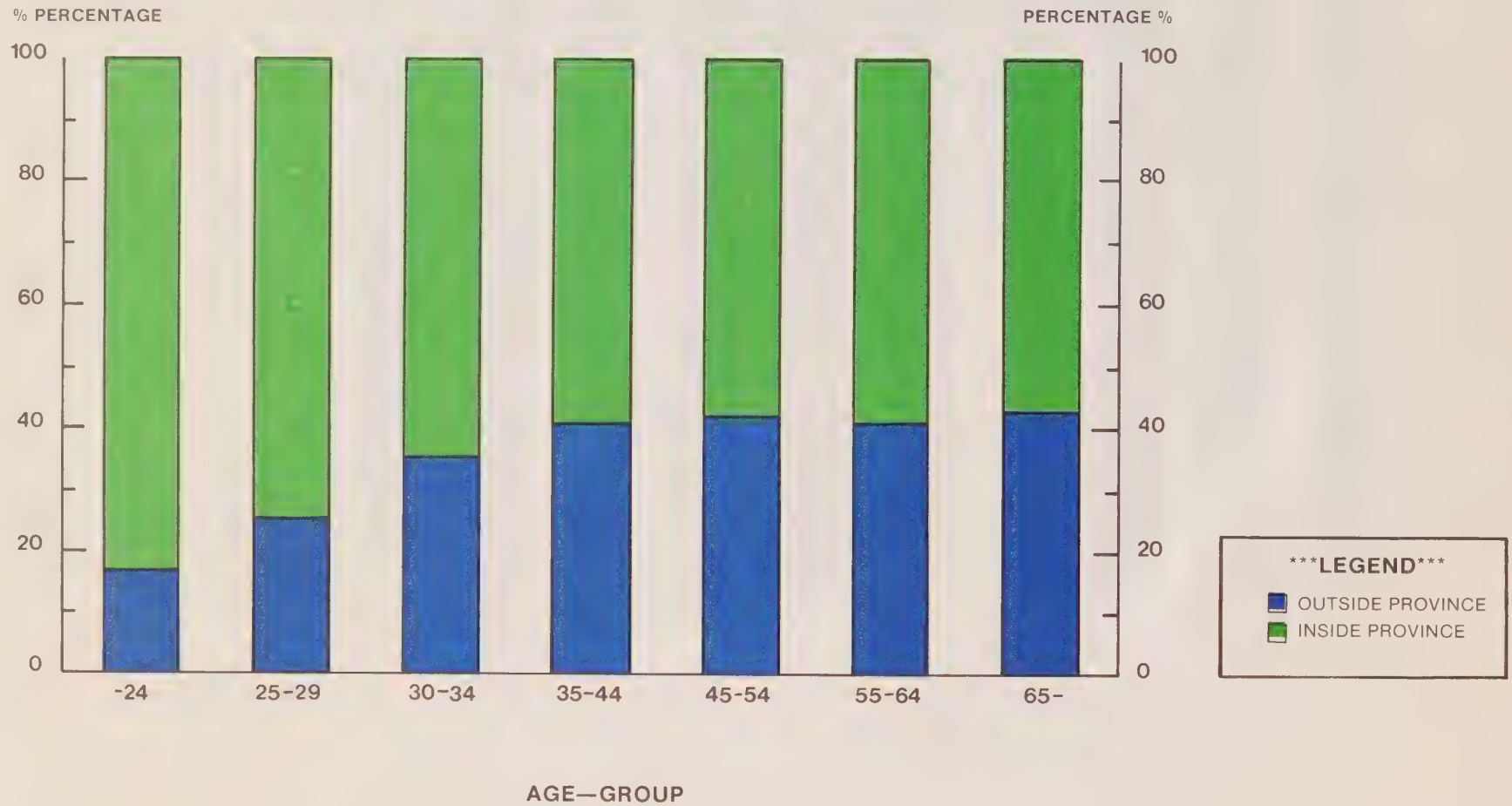


FIGURE VIII.8 Proportion of degree-holders who took highest degree inside and outside of province of employment in 1973, by type of degree

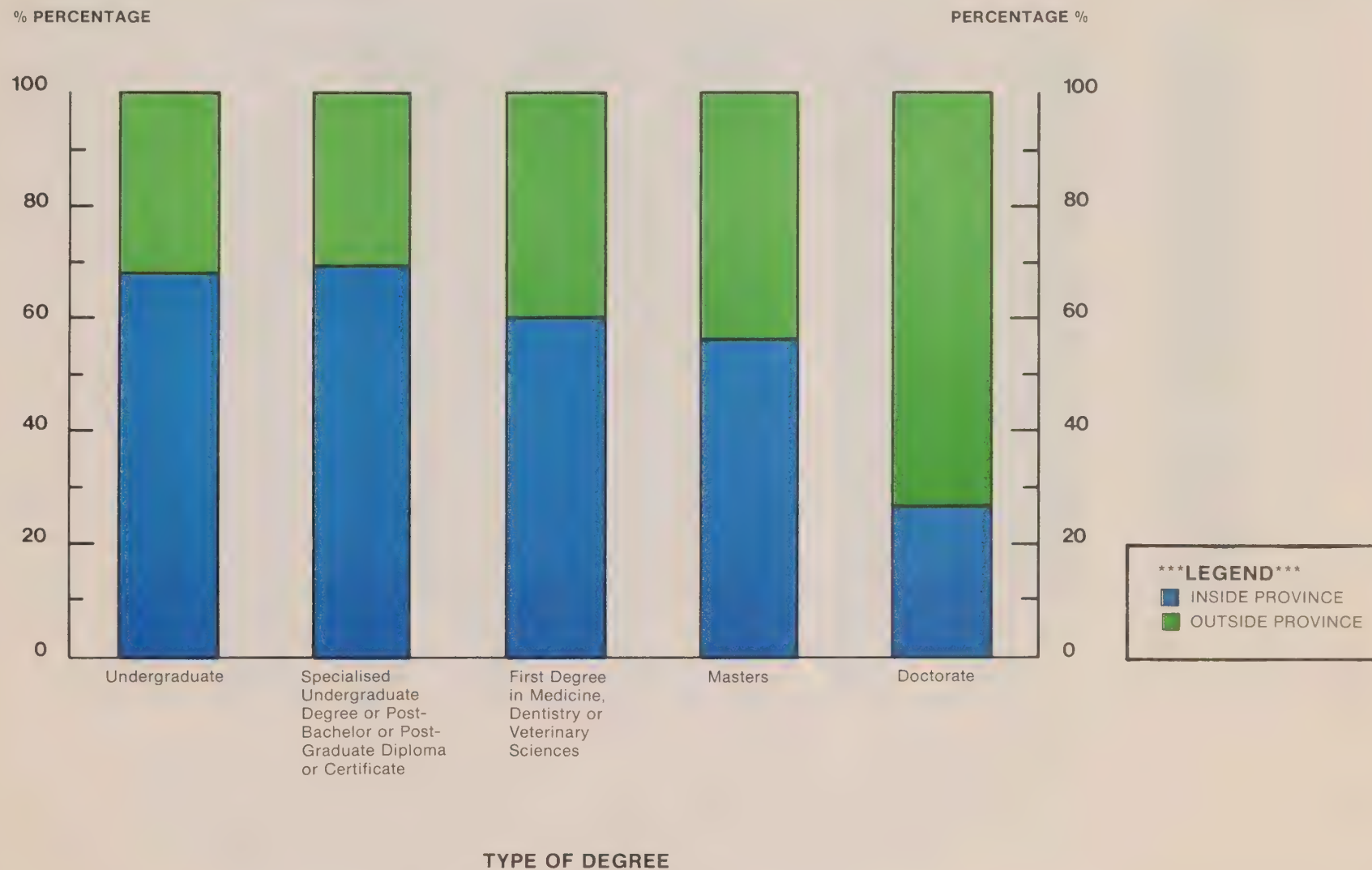


FIGURE VIII.9 Proportion of persons with a doctorate who took highest degree inside and outside province of employment in 1973, by major field of study

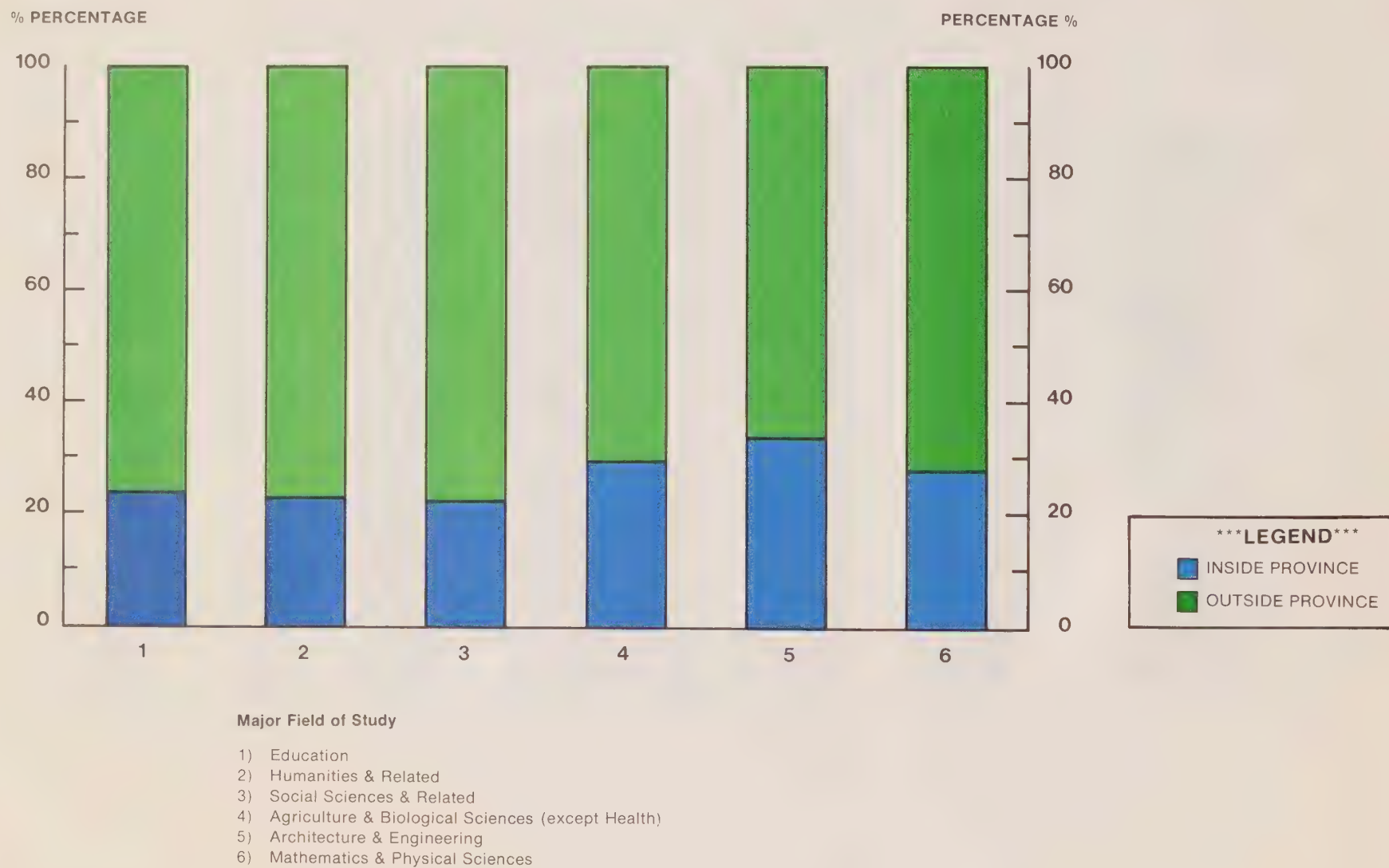


FIGURE VIII.10 Proportion of degree-holders in selected occupation groups who took highest degree inside and outside province of employment in 1973

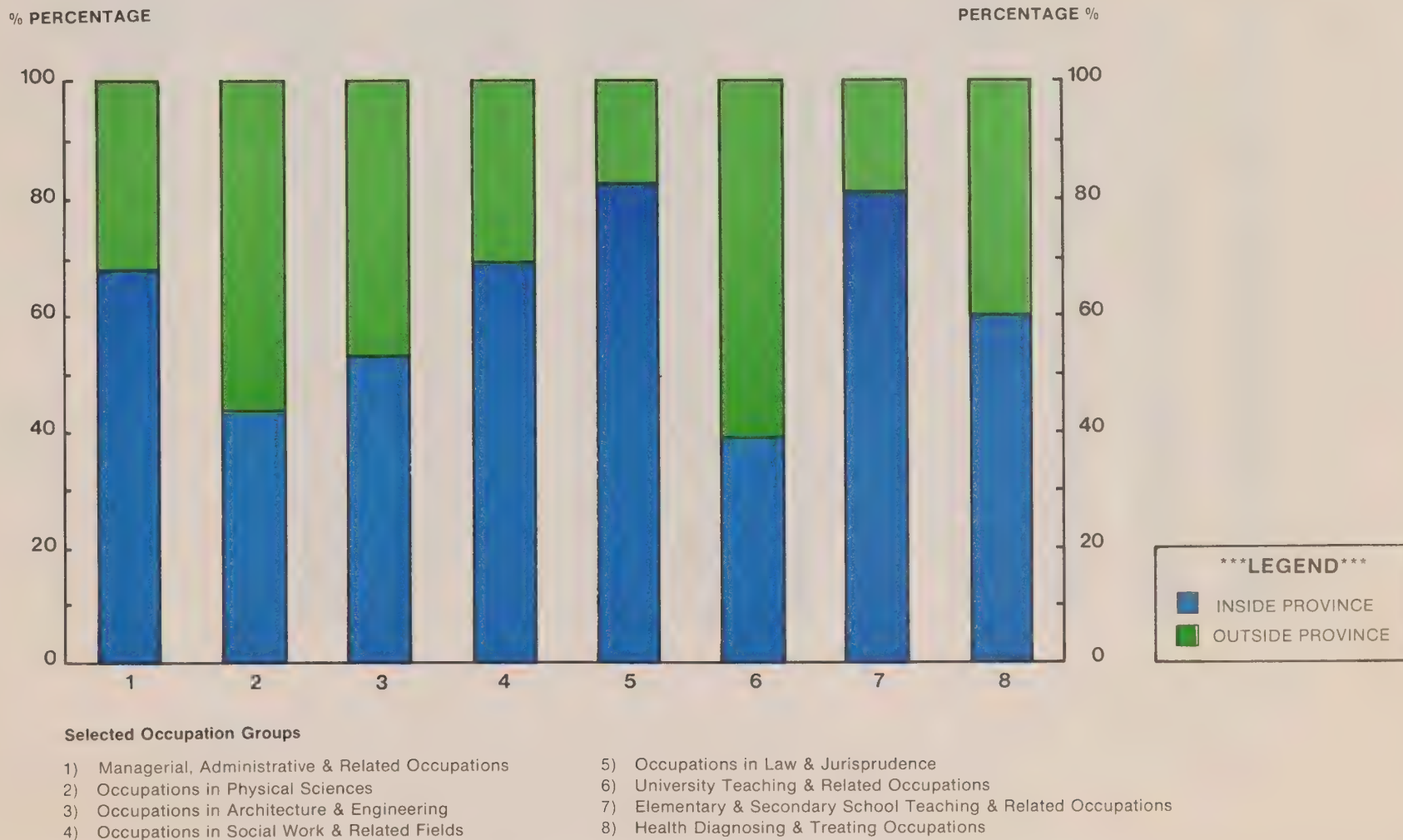


FIGURE VIII.11 Geographic mobility of Canadian-educated degree-holders by province of employment, 1973

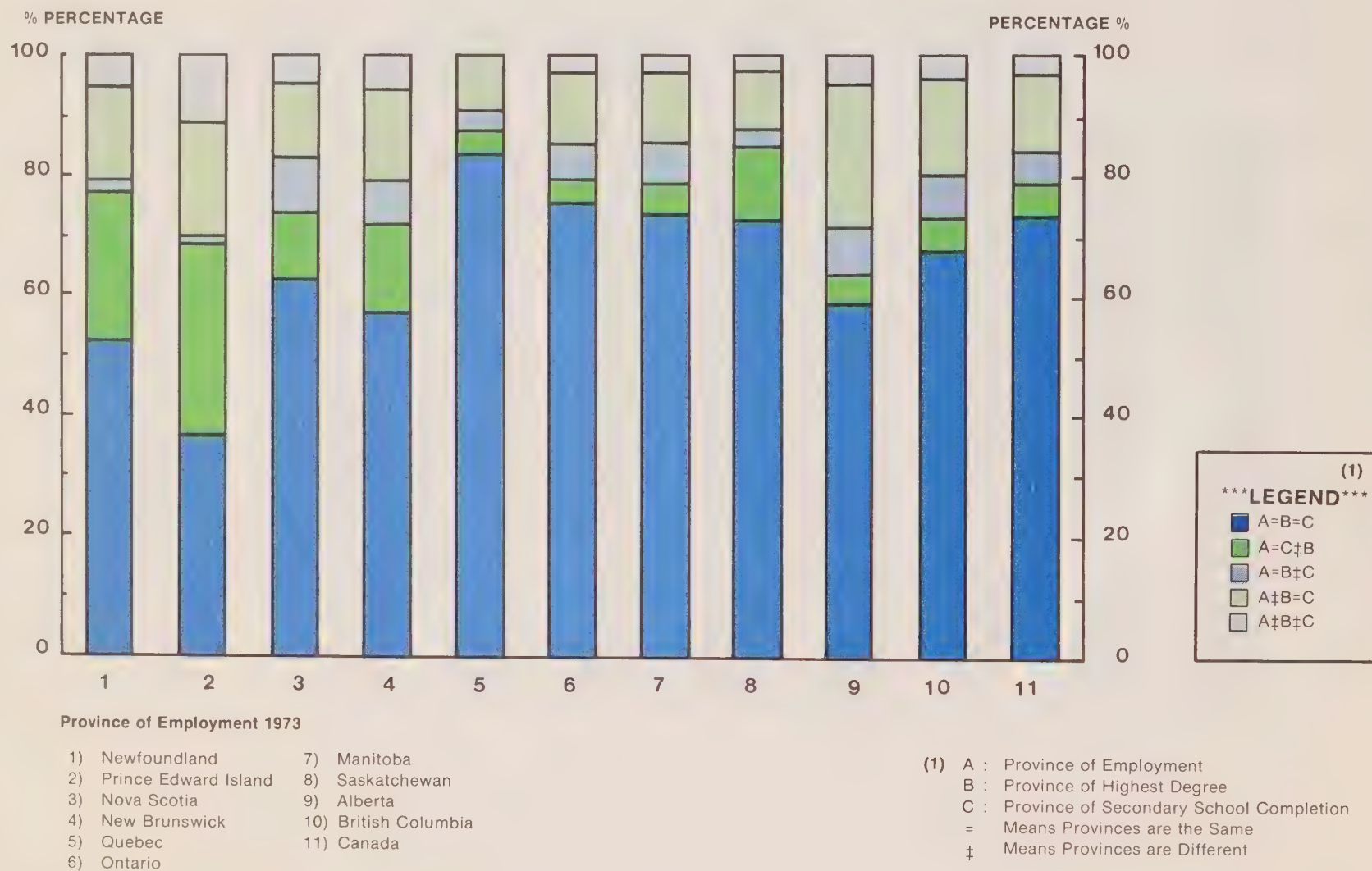
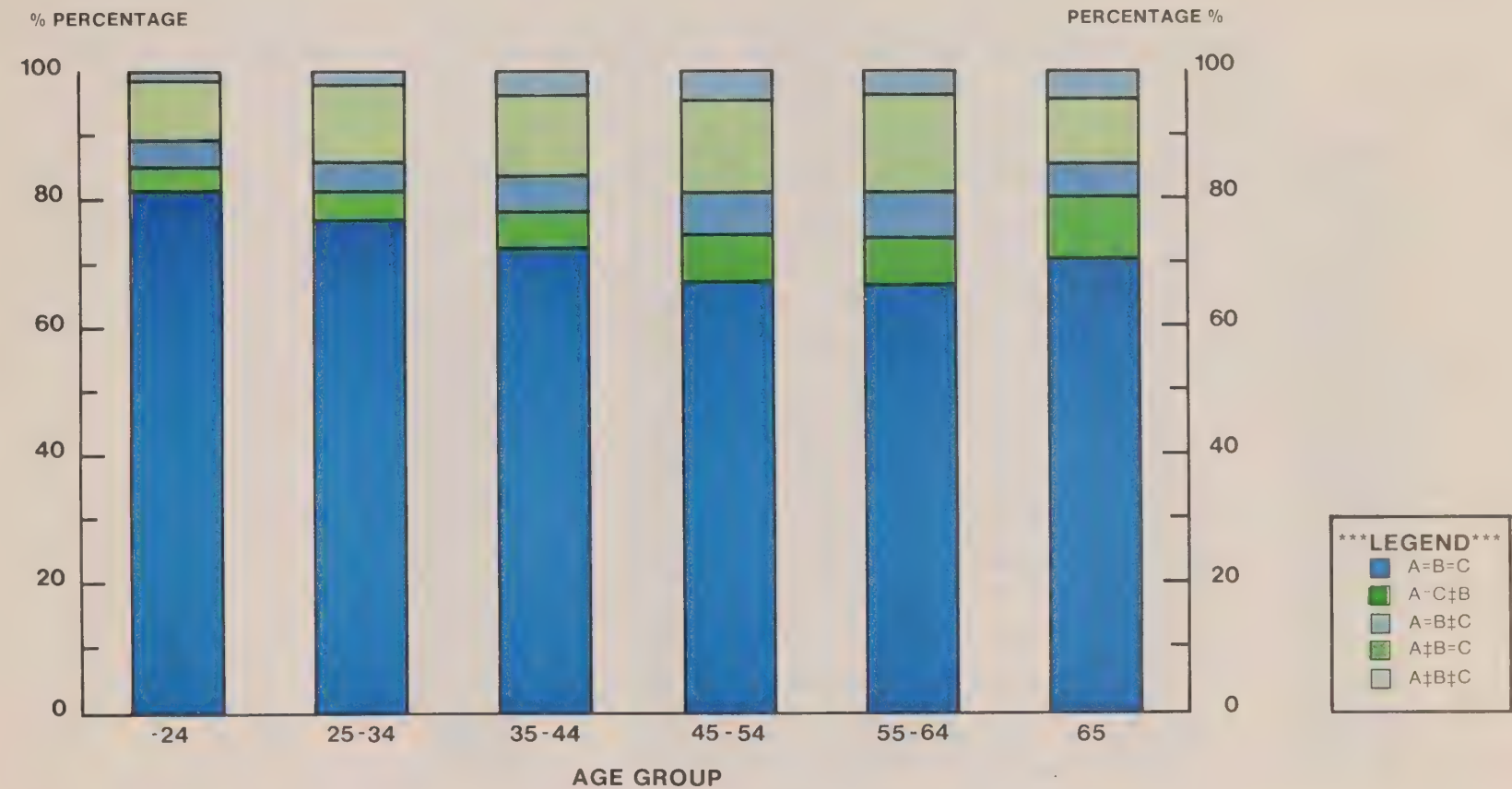


FIGURE VIII.12 Georgraphic mobility of Canadian-educated degree-holders by age

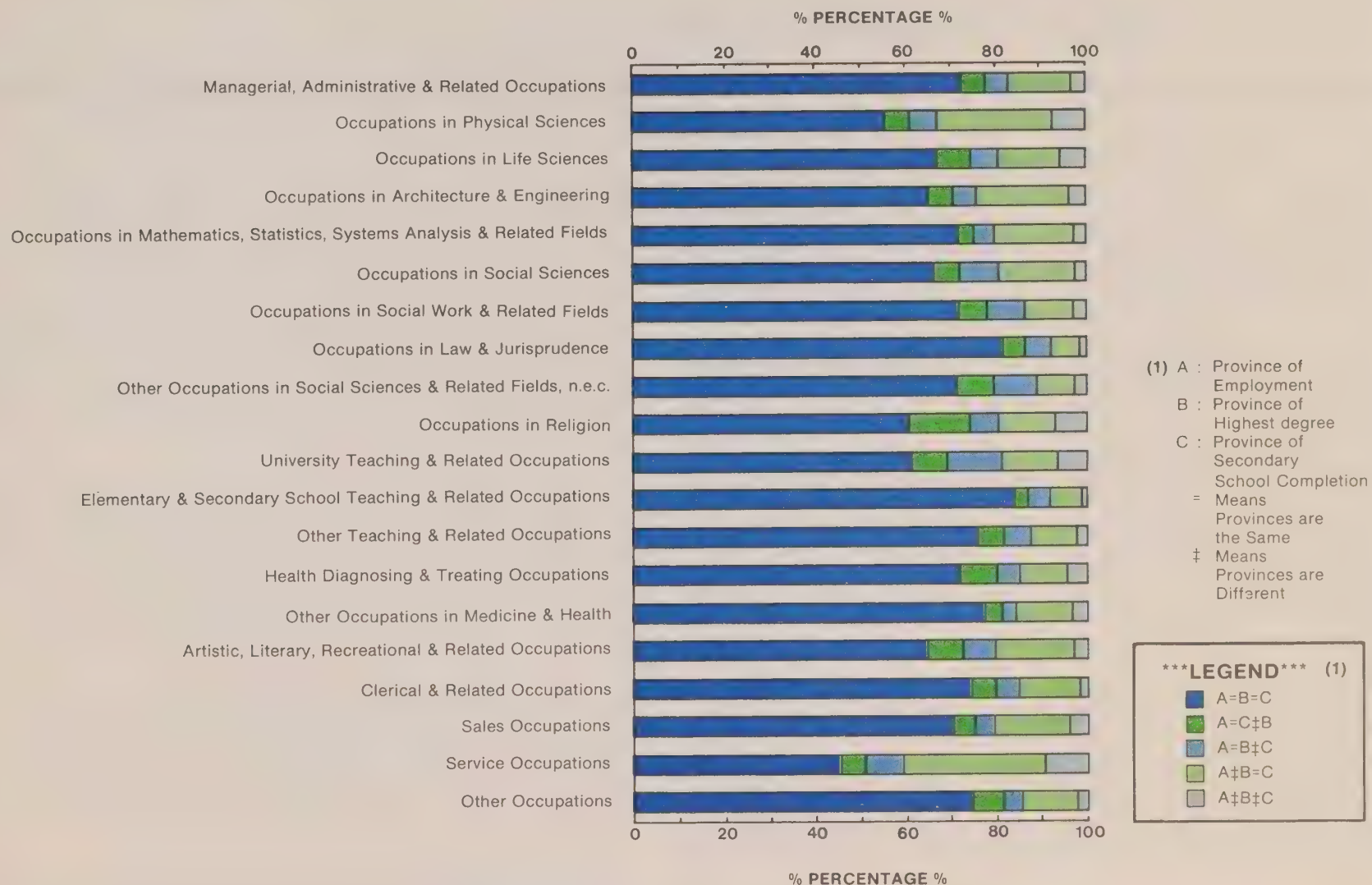


(1) A : Province of employment
B : Province of highest degree
C : Province of Secondary School Completion
= Means provinces are the same
‡ Means provinces are different

FIGURE VIII.13 Geographic mobility of Canadian-educated degree-holders by type of degree



FIGURE VIII.14 Geographic mobility of Canadian-educated degree-holders by occupation in 1973



Chapter IX

The Earnings of Degree-Holders

Introduction

It is well known that there is considerable variation in the earnings of individuals in the Canadian labour force. Earnings vary by age, by occupation, by province of employment, by ability, by sex, and by many other factors. Earnings also vary by education, and many studies have shown that degree-holders often earn higher incomes than secondary school graduates (see, for example, [28]). However, there has been relatively little analysis of the earnings differentials between different types of degree-holders in Canada. (One of the few examples is [10].)

It is reasonable to assume that earnings of different types of degree-holders will vary substantially. The cost of university education in some fields is higher than that in other fields because of differences in fees and other expenses, and in income foregone during the training period. From an investment point of view, it would be worth obtaining a more expensive degree only if the returns or earnings were expected to be higher as well. Indeed, if the labour market were functioning efficiently, the earnings in occupations would exceed the costs of the required training by a sufficient margin to make the investment profitable. Thus, earnings differentials by occupation will normally exist in an efficient labour market.

However, earnings would also differ by occupation if the labour market were not functioning efficiently. For example, if a professional association were to limit the supply of labour in a particular occupation by, say, restricting membership in the association, earnings would be maintained at a higher level than would be possible in the free market. It has been argued that physicians and surgeons are such a group since the supply of doctors is limited through rigid selection of students and restrictive licensing procedures for new entrants to the occupation (see [16]).

In an efficient labour market, earnings differentials could also arise because of differences in the productivity of individuals. Individuals vary considerably in terms of such factors as age, ability, and work experience, and these all have an impact on productivity and hence on earnings. At the same time, employers may

discriminate against a particular group of individuals, in which case their earnings could well be less than those for other groups. There is some evidence that women are subject to some discrimination by employers and so receive lower earnings than men (see for example [19]).

The effects of geographic location on the earnings of degree-holders are more complicated and they depend on a wide range of factors such as the structure of the local economy, the supply of trained manpower, and the effects of other labour markets. Thus, it may be the case that average earnings in two regions differ considerably but not at all for a particular occupation, because of very different labour market conditions in the two regions.

Provincial differences in earnings may have important effects on the geographic mobility of degree-holders. As noted in Chapter VIII, degree-holders may change province in response to differences in earnings between provinces, although other factors are important as well. Since part of the cost of university education is borne by the government of the province in which the university is located, the out-migration of degree-holders represents a financial loss to the province in which they were educated; the potential benefits of the educational investment are lost to the province concerned.

As noted elsewhere [13], students in the Atlantic Provinces appear to pay more for their university education than those in other provinces in Canada. Thus, earnings differentials by province may be particularly important for students in the Atlantic provinces. If their anticipated earnings in the Atlantic region are lower than elsewhere in Canada, the net returns on their investment will also be lower there, so that many degree-holders may have an incentive to move out of the region.

The purpose of this chapter is to examine some of the survey data pertaining to these issues. The following section deals with earnings distributions by occupation and by province. Age-earnings profiles of degree-holders in selected occupations and fields of study and with different types of degrees are examined next. The final section of the chapter discusses the main conclusions of the analysis.

Distribution of earnings

The distribution of earnings for degree-holders is shown for selected occupations in Figure IX.1. The data are for individuals who worked on a full-time basis for 40 or more weeks in the twelve-month period prior to the survey, which corresponds roughly to calendar year 1973. Thus the effects of part-time employment are excluded from the data.

The distributions vary markedly from one occupation to the other. Some distributions show the typical positive skewness of income distributions so that the proportion of persons with very high earnings is fairly small. For example, 72 per cent of all accountants and auditors earned less than \$18,000 and only five per cent earned \$30,000 or more. Many distributions also show a well-defined peak indicating that the earnings of a substantial proportion of persons in the occupation were within a small range. For example, of electrical engineers slightly more than half reported incomes of more than \$12,000 but less than \$18,000; nearly 80 per cent had incomes of between \$12,000 and \$24,000.

The earnings distribution for physicians and surgeons is remarkably different from that for other occupations. The distribution is fairly uniform over the income range shown, and roughly the same proportion (30 per cent) reported earnings of \$30,000 — \$44,999 and of \$45,000 or more; at the same time, 12 per cent reported earnings under \$12,000. This wide variation is partly a reflection of the uniform age-distribution noted for physicians and surgeons in Chapter V. It is probably also due to the long post-graduate training period, and the consequent lower incomes, associated with most medical specialists in training.

The distributions show clearly that average earnings vary considerably by occupation. As might be expected, persons in professional occupations — physicians and surgeons, dentists, lawyers and notaries — had much higher earnings than those in other occupations. Thus, 29 per cent of physicians and surgeons, 12 per cent of dentists and 14 per cent of lawyers and notaries reported earnings of \$45,000 or more. In most other occupations, less than one per cent reported such earnings. One exception was for general managers: 20 per cent reported earnings of \$45,000 or more.

At the other end of the scale, social workers, librarians and archivists, and elementary school teachers reported the lowest earnings. Roughly 60 per cent of persons in these occupations reported earnings of less than \$12,000; less than four per cent in each of these occupations reported earnings of more than \$18,000. These are occupations in which the proportion of women was fairly high so that the lower earnings will in part be due to the lower incomes earned by women (See Chapter X for some discussion of these differentials).

These findings are much the same when the earnings distributions for different occupations are compared across provinces; these are shown for selected occupations in Figures IX.2 to IX.6. The distributions generally show the same pattern of variation between occupations as in Figure IX.1; thus, although there are some differences between the distributions for the same occupation in the various provinces, there is in fact a high degree of similarity between them. For

example, the earnings distribution for civil engineers shows the same high degree of positive skewness noted above. Similarly, the distributions for secondary school teachers whose earnings are regulated by provincial authorities all have a small variance, and hence their earnings in all provinces were concentrated in a fairly small range. Physicians and surgeons earned relatively high incomes in all provinces: for example, 75 per cent of those in Newfoundland and 64 per cent of those in Quebec reported earnings of \$30,000 or more. These data therefore suggest that differences in earnings in such occupations may be independent of the province of employment.

For most occupations, the distributions for the Atlantic Provinces showed lower incomes than those for other provinces. For example, one-third of all secondary school teachers in each of the Atlantic Provinces earned more than \$12,000; the proportion is much higher for all other provinces except Quebec. Similarly, more than one-quarter of the civil engineers in the Atlantic Provinces earned less than \$12,000; a smaller proportion in the other provinces earned less than \$12,000. One exception in this respect is for physicians and surgeons who seemed to earn as much in the Atlantic Provinces as elsewhere in Canada. For example, at least two-thirds of the doctors in Newfoundland and in Nova Scotia reported earnings of \$30,000 or more, and this was higher than the proportion in the other provinces.

The earnings distributions for the various provinces are also shown for all occupations in Figure IX.7. These figures confirm the general finding that earnings in the Atlantic Provinces were on the whole lower than those in other parts of Canada. Thus, between 47 and 61 per cent of all degree-holders in the Atlantic Provinces earned less than \$12,000 in the year prior to the survey; for the other provinces the figures varied from 40 per cent in Quebec and Saskatchewan to 32 per cent in Ontario. The proportion earning \$30,000 or over was also lower in the Atlantic Provinces than elsewhere in Canada; the only exception here was Newfoundland. Similarly, for each of the Atlantic Provinces, for Quebec and for Manitoba, the modal or typical earnings were in the range \$6,000 — \$11,999; for the other provinces, they were in the range \$12,000 — \$17,999.

Age-Earnings Profiles

As noted in Chapter V, the age distributions of individuals in different occupations differed substantially. Since earnings also vary with age, the observed occupational differentials in earnings may be due partly to differences in age. For example, since physicians and surgeons were older on average than persons in other occupations, some of their higher earnings might simply be due to the higher proportion of older persons in the occupation. The effects of age can be eliminated by comparing age-earnings profiles for occupations: these simply show the average earnings for individuals at different ages for various occupations.

Age-earnings profiles based on cross-section data generally have a common shape. Earnings tend to be low for young persons and to rise progressively with age until a peak is reached some years before retirement; they often fall continuously after the peak. The profiles for various levels of education usually

vary significantly: for persons with more education, the peak tends to occur at a higher age, and the slope of the curve before the peak is generally greater, than that for persons with less education. The general shape of age-earnings profiles has been explained by the theory of human capital which treats expenditures on education as an investment yielding returns throughout the working lives of individuals (see [6]).

The data in Figures IX.8 to IX.16 show age-earnings profiles for different occupations, fields of study and types of degree. The data refer to the average (mean) earnings reported by males who worked on a full-time basis for 40 or more weeks in the twelve months prior to the survey. Thus the effects of sex and part-time employment are excluded from the figures. It will be evident that the number of observations would have been small for some categories and the averages would be unreliable in these cases. It was decided for this reason to omit averages for which the estimated population was less than 100 (because of the sampling procedure, this would correspond to roughly 17 original observations). These omissions appear as gaps in the respective graphs.

The profiles for selected occupations are shown in Figures IX.8 and IX.9: the points plotted on the graphs correspond to the mid-points of the age groups used. The profiles generally follow the expected pattern noted above: earnings were low for young persons and tended to reach a peak before retirement. Earnings also varied considerably by occupation. For example, for physicians and surgeons aged 55-64, average earnings were reported to be \$38,000; for social workers of the same age, they were only \$14,000. For those aged 25-29, average earnings were \$18,000 and \$10,000 for physicians and surgeons and social workers respectively. Similarly, lawyers and notaries aged 45-54 reported average earnings of \$33,000 while secondary school teachers of the same age had average earnings of \$15,000.

An attempt has been made in Figures IX.10 and IX.11 to examine the effects of field of study on the age-earnings profiles by comparing the profiles for persons in the same occupation but with different major fields of study. For example, in Figure IX.10 the profile of industrial engineers who specialised in social science fields is compared with that for industrial engineers who specialised in architecture and engineering fields. The other comparisons are: accountants and auditors who specialised in commerce (accounting) or in commerce (general); agriculturists who specialised in agriculture or in forestry; general managers who specialised in social science or in architecture and engineering; economists who specialised in economics or in commerce (general); elementary and secondary school teachers who specialised in education or in the humanities.

These comparisons suggest that earnings differences by field of study are much smaller than those by occupation. For example, the profiles in Figure IX.11 show considerably higher variation across occupations than across fields of study. This is illustrated more clearly in Figure IX.12 which compares the profiles for specialists in the social sciences who were working in four different occupations. There is considerable variation in the earnings profiles of the various occupations despite standardisation for field of study.

It follows that an individual's occupation may be a more important

determinant of his earnings than field of study. Field of study clearly has an effect on the occupations individuals may enter (see Chapter VI), but it seems to play a minor role in earnings once the individual is in a given occupation.

It is interesting to speculate on some of the reasons for the differences in the profiles in Figure IX.12. One possible explanation is that persons in the different occupations had different abilities and so received different rewards. Another is that the work functions, or working conditions, or some other factor related to the various occupations are in fact different and hence generate earnings differences. A third possibility is that there are imperfections in the labour market for the various occupations which cause earnings differences. However, none of these explanations could be explored using the data in the survey.

In Figures IX.13 and IX.14, age-earnings profiles are compared for different degree levels in selected occupations. Although the differences between the profiles are not large, they seem to be fairly consistent with the investment approach to educational expenditures: since the cost of a degree increases with the level of the degree, earnings will also be expected to increase with degree level, in order to provide adequate compensation for the additional costs. For example, the profiles for chemists show that those with a doctorate earned less at age 25-29, but more at older ages than those with an undergraduate degree. Similarly, government administrators with a masters degree earned more at all ages than those with an undergraduate degree. Civil engineers with a masters degree earned less than those with a specialised undergraduate degree up to age 35-44 but more thereafter.

Finally, the earnings profiles for university teachers are shown in Figures IX.15 and IX.16. The former shows profiles by field of study while the latter shows them for different degree levels and selected fields of study. These generally confirm the findings above; for example, there is some variation in the profiles by field of study with specialists in medicine showing a much higher profile than others. This is not surprising since the earnings in an occupation are determined partly by the earnings in other occupations to which particular degree-holders may move; thus the earnings of university teachers in medicine will depend partly on the earnings of physicians and surgeons. Many university teachers in medicine probably also maintain a medical practice and hence earn higher incomes than most other university teachers.

Conclusions

The earnings of degree-holders who worked in a full-time job for 40 or more weeks in the year prior to the survey, which roughly covers calendar year 1973, were analysed in this chapter. The earnings distributions of persons in selected occupations and in the various provinces were first examined. These show that earnings vary considerably between occupations; the differences in occupational earnings were apparent for each province, but there also seemed to be substantial differences between the earnings distributions of degree-holders living in the various provinces. In general, degree-holders in the Atlantic provinces appear to earn much less than those in other parts of Canada.

The differences in occupational earnings were also evident from an examination of age-earnings profiles for male degree-holders in selected occupations. Many of the profiles followed the typical shape of age-earnings profiles based on cross-section data: earnings tend to be low for the young and to rise with age to a peak sometime before retirement age.

Age-earnings profiles were also compared for males in selected occupations with different fields of study and with different types of degree. The graphs showed that there were some differences in earnings by field of study and by type of degree, but these differences were generally much smaller than those by occupation. This suggests that the occupation in which a degree-holder becomes employed may be a more important determinant of his earnings than the field of study in which he specialises or the level of degree he obtains. Thus, field of study and level of degree may be important determinants of the occupation an individual enters, but they appear to play a minor role in determining his earnings within the occupation.

The analysis here also raises some questions about the validity of the human capital or investment theory of education. Basically the theory postulates that expenditures on education may be treated as investments which yield future returns in the form of higher earnings. Thus, it assumes that individuals will invest in more education only if they expect to receive an adequate return on their investment. In this case, if the labour market works efficiently in allocating people to jobs, differences in the earnings of degree-holders should reflect differences in the cost of their education.

Some of the evidence here tends to support the theory. For example, persons with a bachelors degree earned less than those with higher degrees which cost more, but the differences were not large. In general, however, many of the data seem to be inconsistent with the theory: for example, persons with the same degree for which the costs would often have been the same had quite different earnings in different occupations.

These findings suggest that the market may not be very efficient, so that earnings for some jobs may be above the free market wage because of imperfections in the labour market. It also suggests that other factors, such as innate ability and related work experience, may also be important determinants of the earnings of individuals. These issues are discussed again in Chapter XI of this study.

FIGURE IX.1 Distribution of earnings (1973) for selected occupations

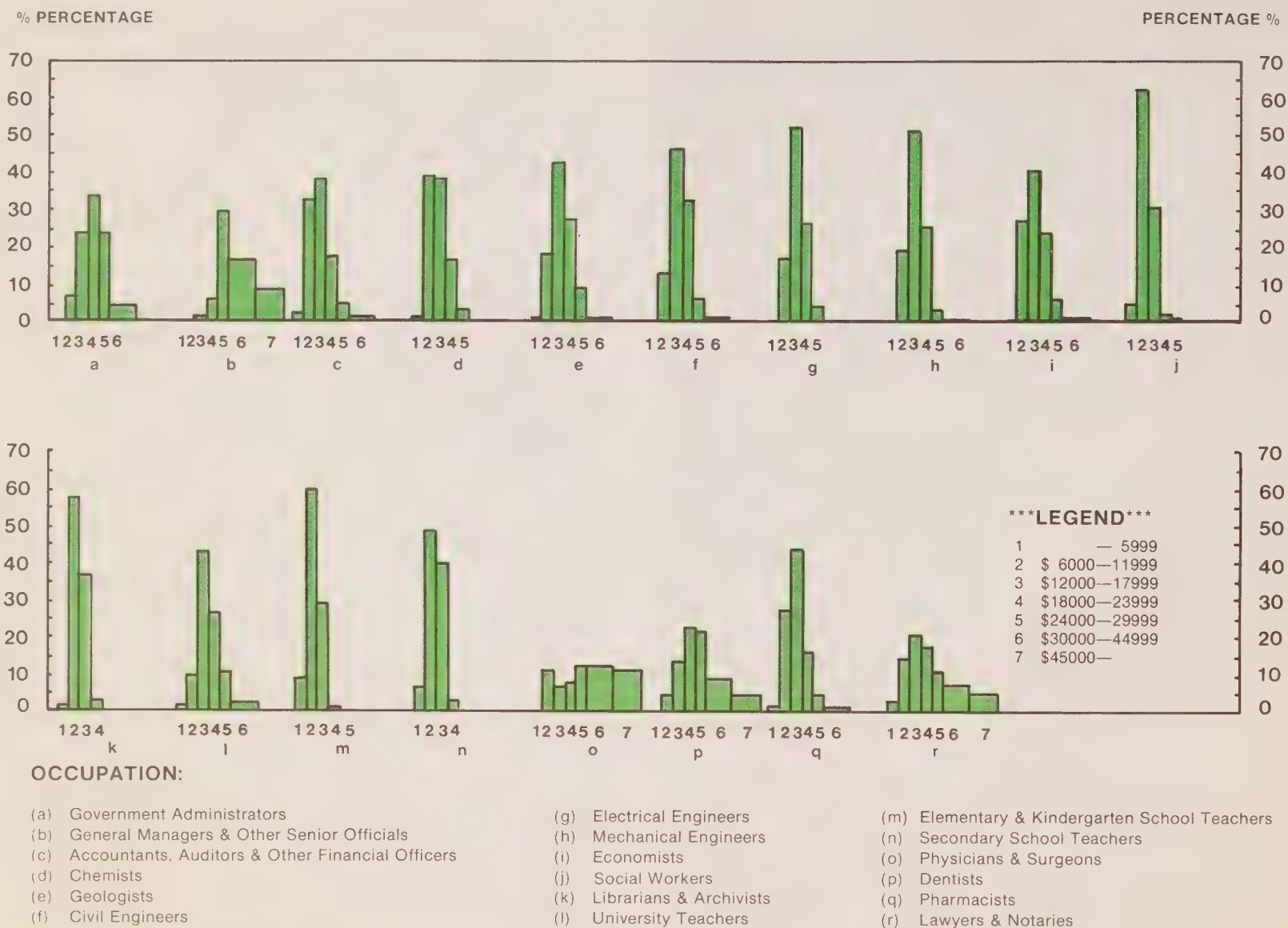


FIGURE IX.2 Distribution of earnings (1973) by province for administrators in teaching & related fields

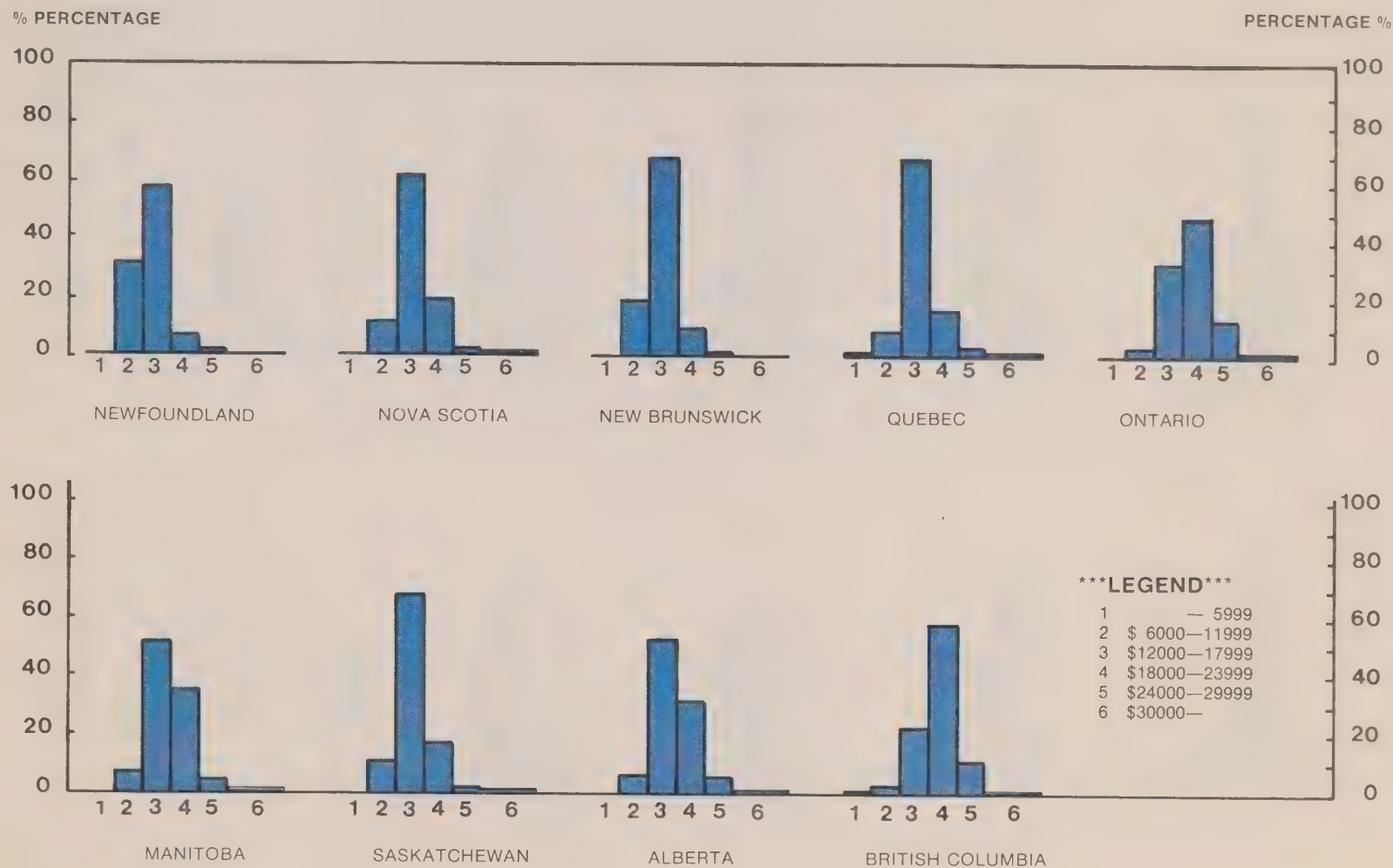


FIGURE IX.3 Distribution of earnings (1973) by province for university teachers

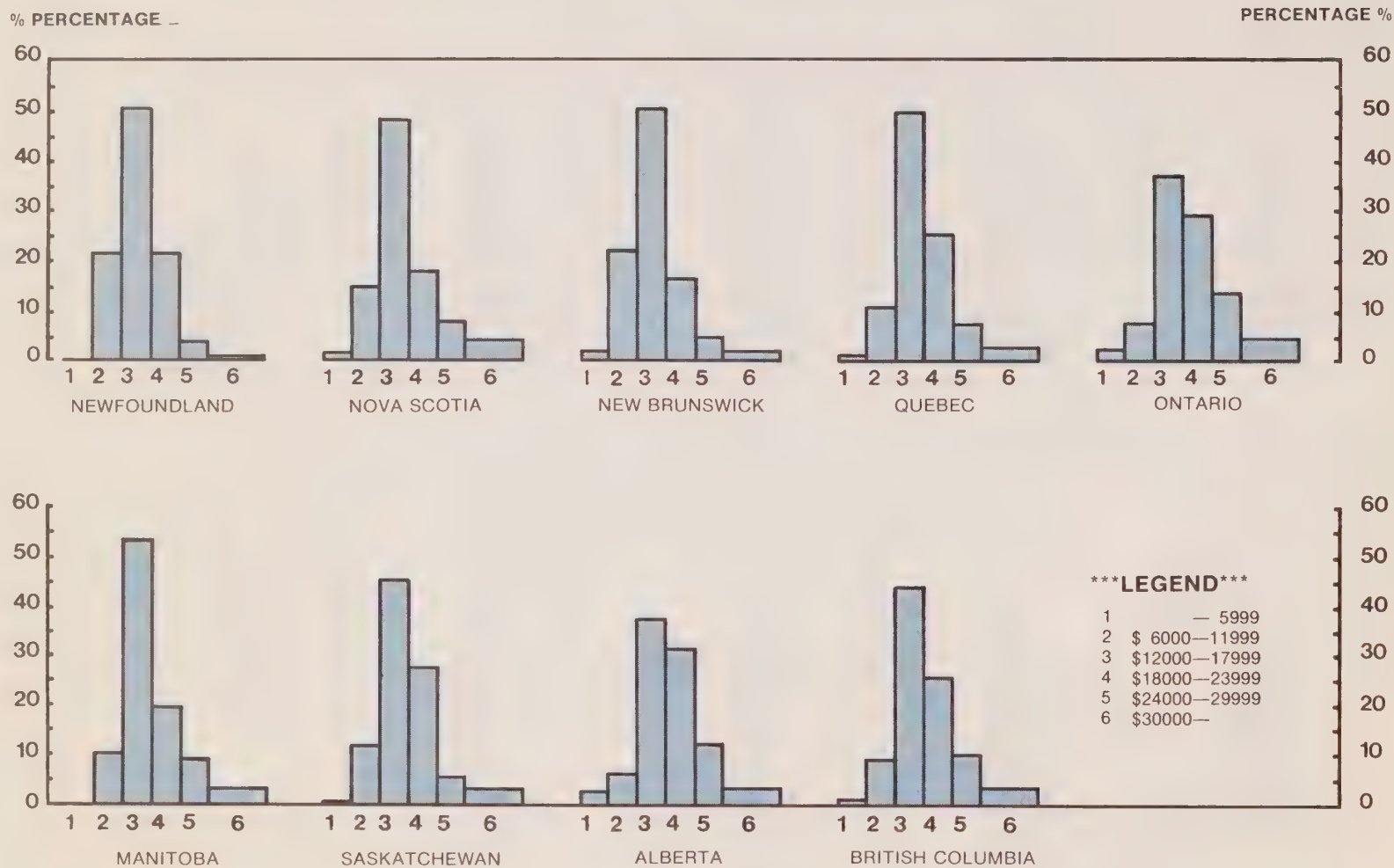


FIGURE IX.4 Distribution of earnings (1973) by province for secondary school teachers

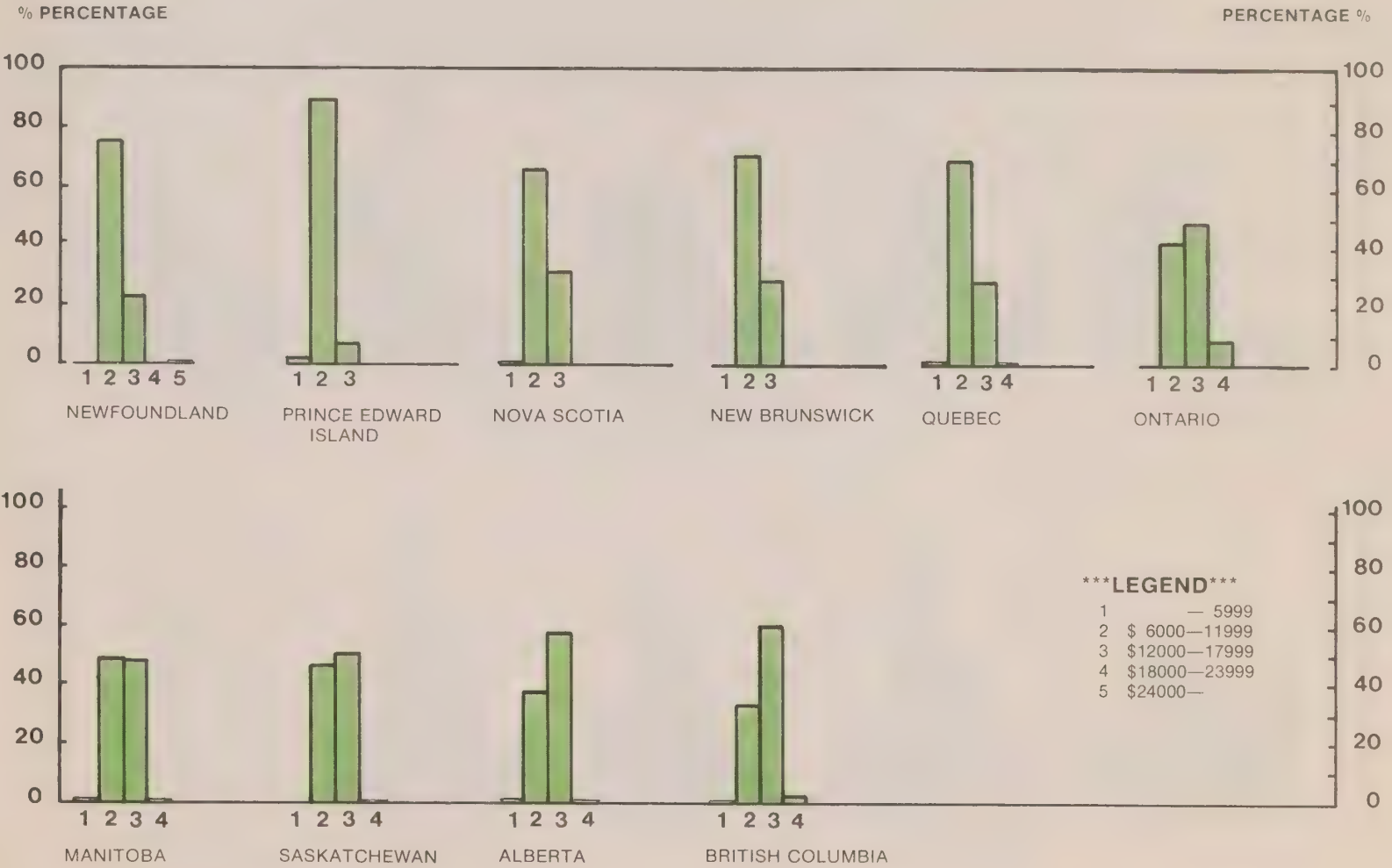


FIGURE IX.5 Distribution of earnings (1973) by province for physicians & surgeons

% PERCENTAGE

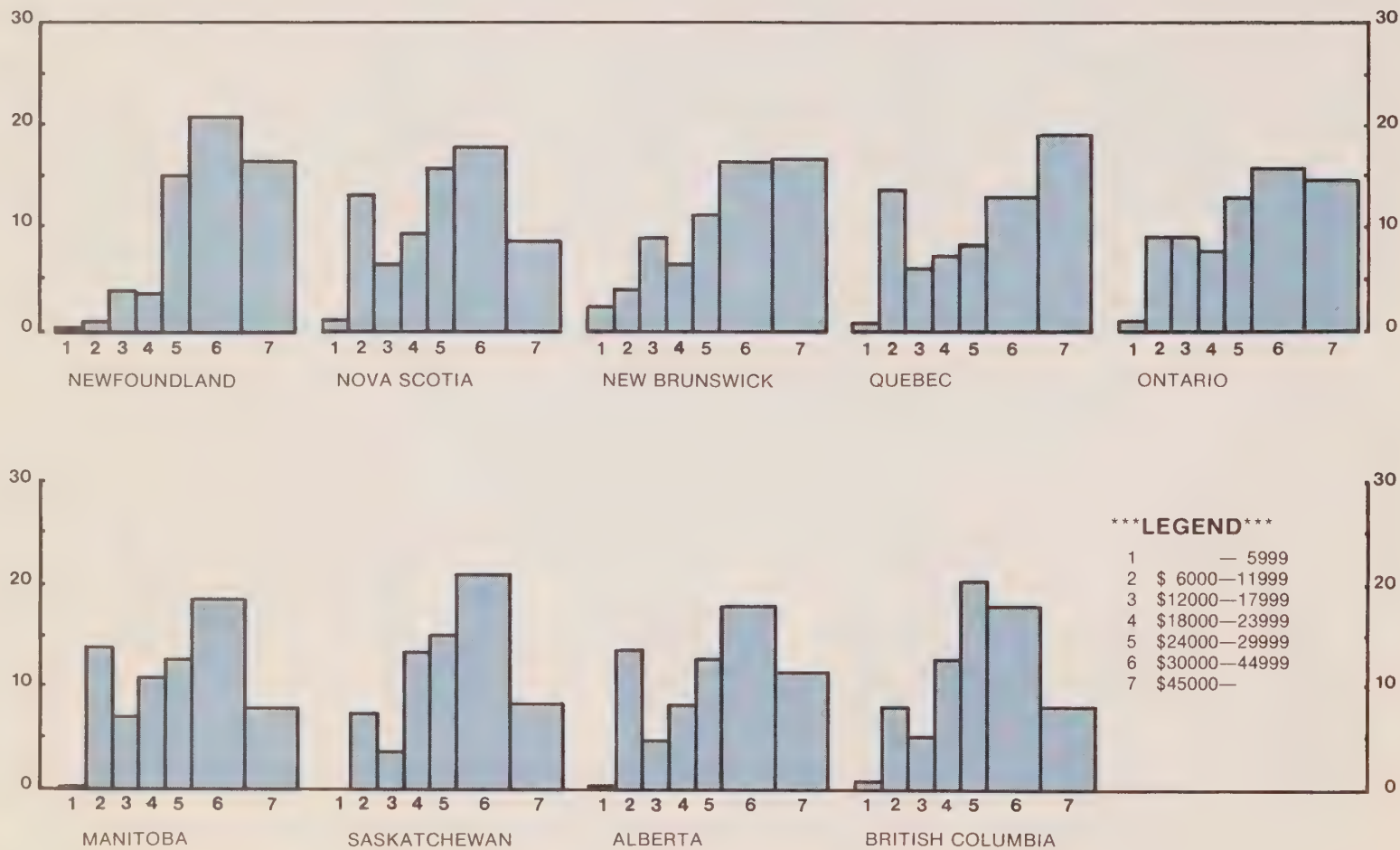


FIGURE IX.6 Distribution of earnings (1973) by province for civil engineers

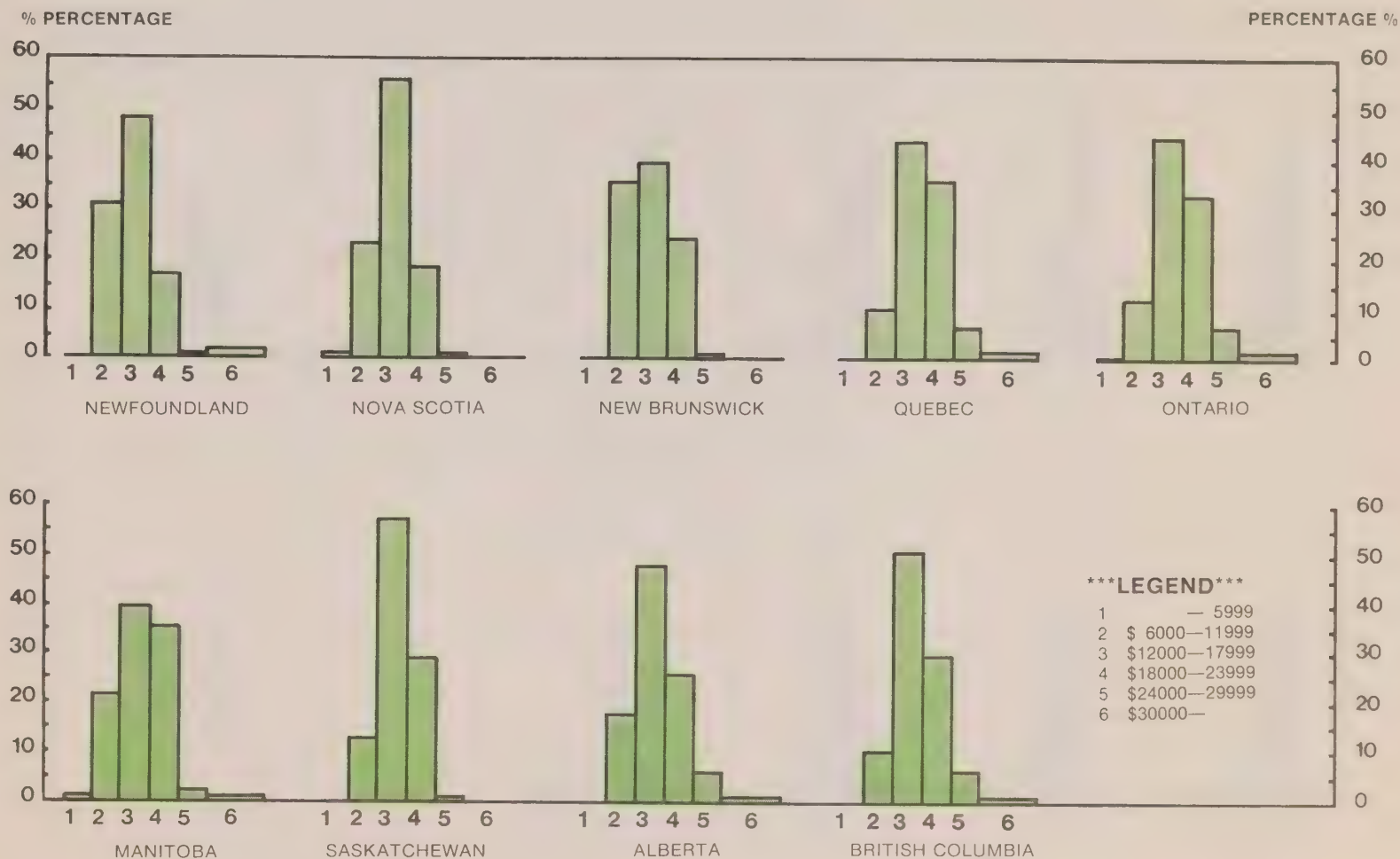
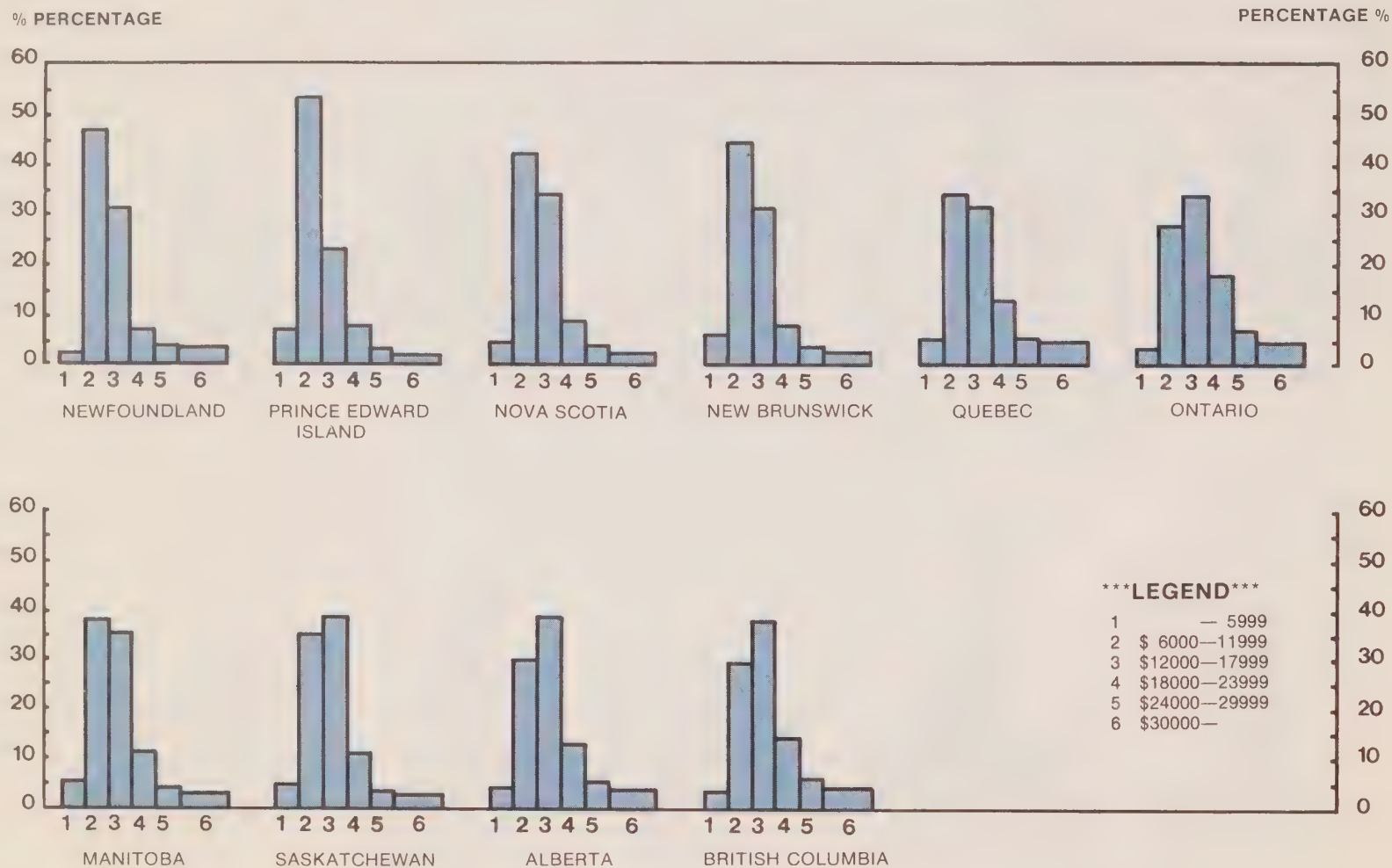


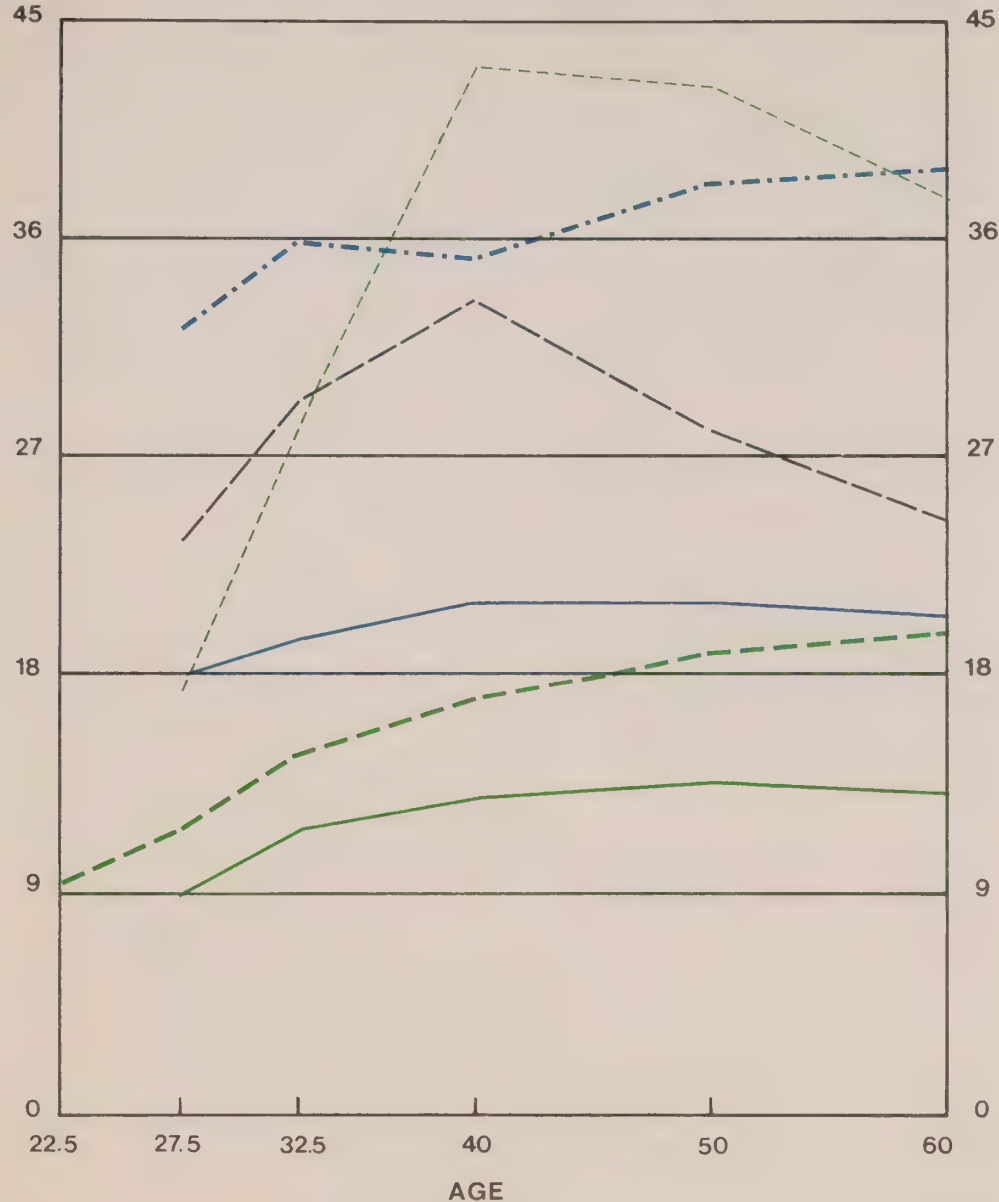
FIGURE IX.7 Distribution of earnings (1973) by province for all degree-holders



THOUSAND \$

THOUSAND \$

FIGURE IX.8 Age-earnings profiles for males in selected occupations (a)



*** LEGEND ***

- Social Workers
- - - Physicians & Surgeons
- . - . General Managers & Other Senior Officials
- - - Electrical Engineers
- - - Dentists
- Veterinarians

THOUSAND \$

THOUSAND \$

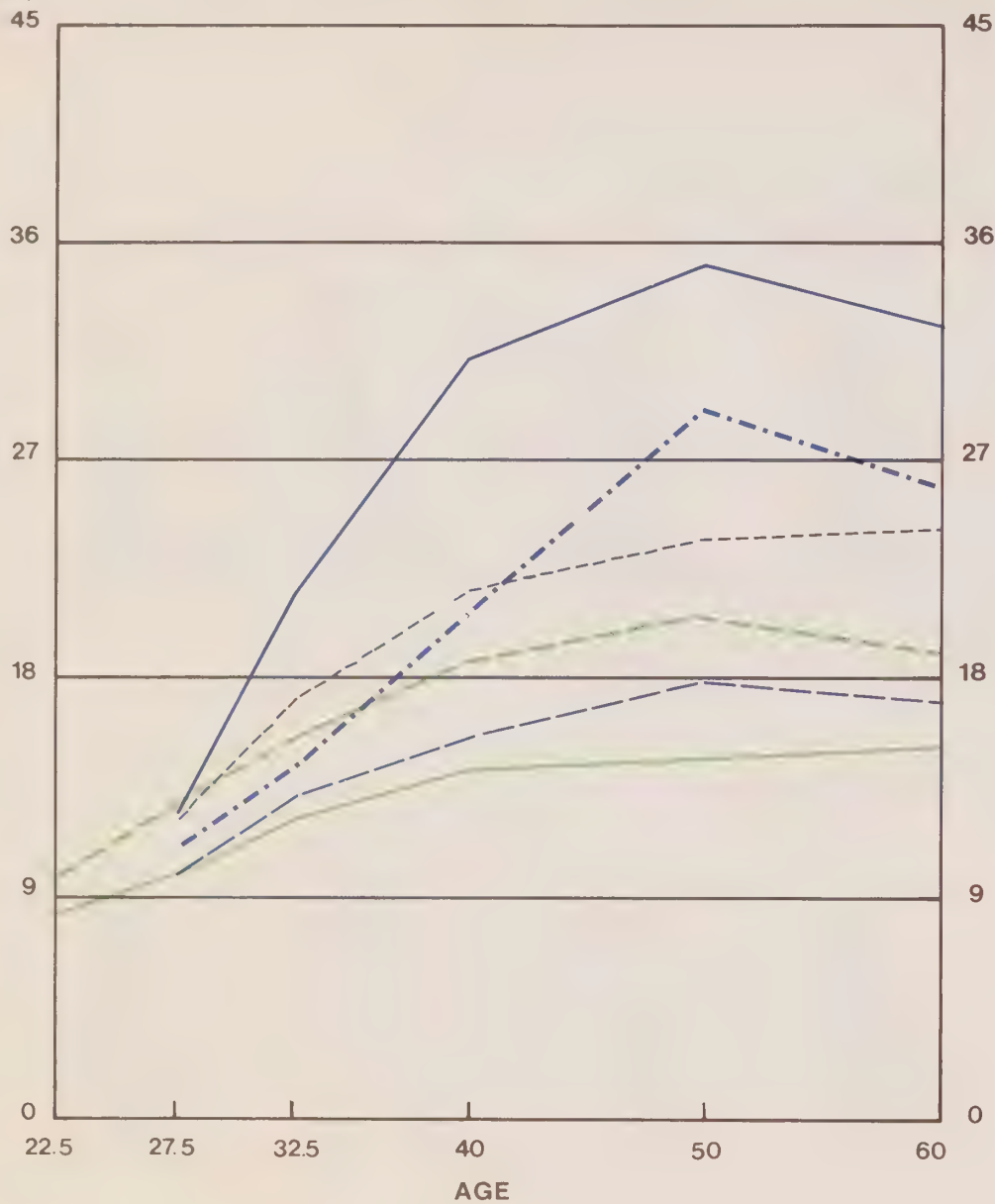


FIGURE IX.9 Age-earnings profiles for males in selected occupations (b)

LEGEND

- Secondary School Teachers
- - - Government Administrators
- . - Architects
- - - Civil Engineers
- - - Chemists
- Lawyers & Notaries

THOUSAND \$

THOUSAND \$

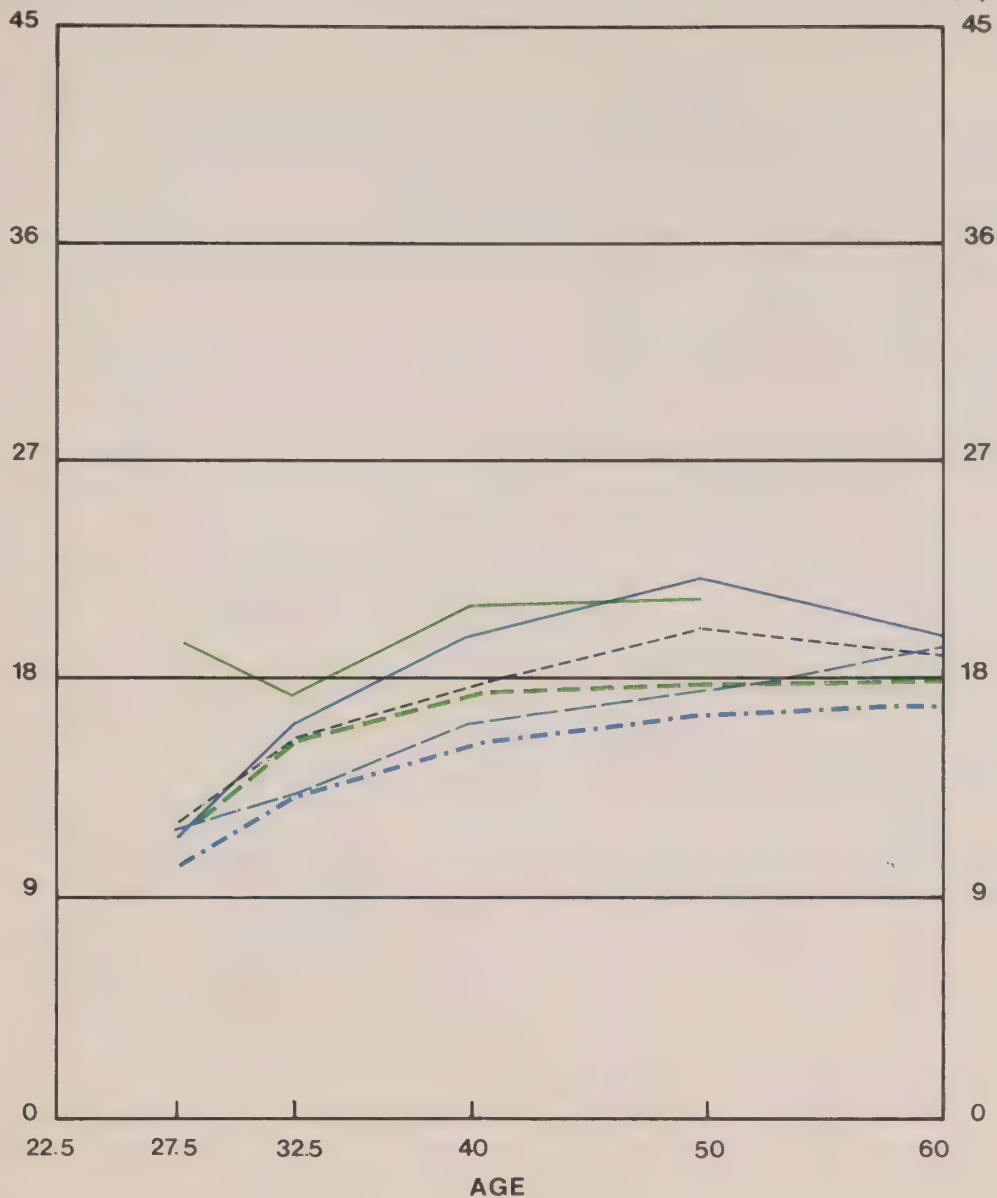


FIGURE IX.10 Age-earnings profiles for males with different specialisations, for selected occupations (a)

LEGEND

- Industrial Engineers (Social Sciences & Related)
- Industrial Engineers (Architecture & Engineering)
- Agriculturists & Related Scientists (Agriculture)
- Agriculturists & Related Scientists (Forestry)
- Accountants, Auditors & Other Financial Officers (Commerce-General)
- Accountants, Auditors & Other Financial Officers (Commerce-specialisation in Accounting)

NOTE: Specialisations are shown in parentheses

THOUSAND \$

45

36

27

18

9

22.5

27.5

32.5

40

AGE

THOUSAND \$

45

36

27

18

9

22.5

27.5

32.5

40

50

60

FIGURE IX.11 Age-earnings profiles for males with different specialisations, in selected occupations (b)

LEGEND

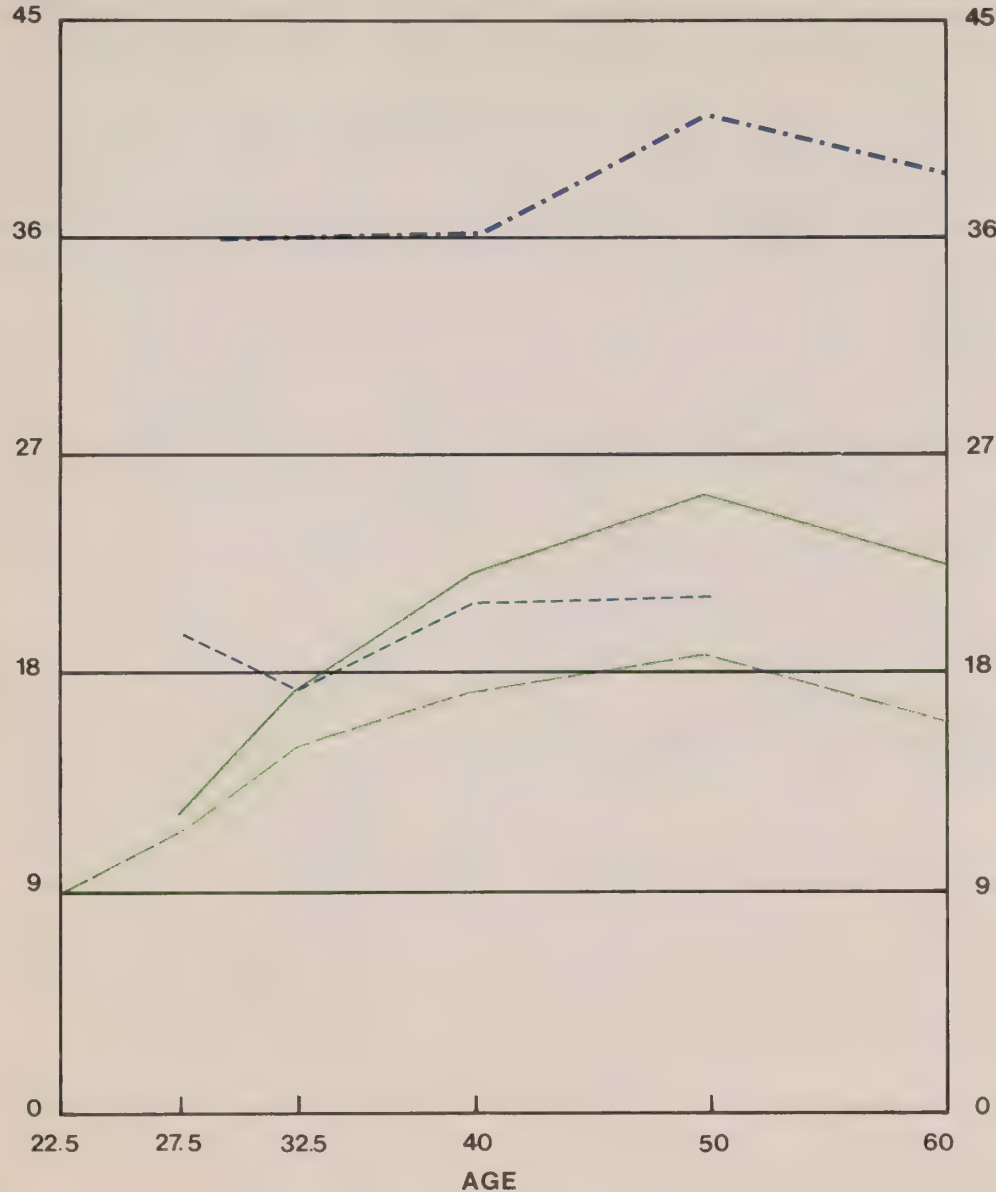
- Elementary & Kindergarten School Teachers (Humanities & Related)
- - - Secondary School Teachers (Humanities & Related)
- . - Elementary & Kindergarten School Teachers (Education)
- - - Secondary School Teachers (Education)
- . - General Managers & Other Senior Officials (Social Sciences & Related)
- General Managers & Other Senior Officials (Architecture & Engineering)
- - - Economists (Economics)
- - - Economists (Commerce-General)

NOTE: Specialisations are shown in parentheses

THOUSAND \$

THOUSAND \$

FIGURE IX.12 Age-earnings profiles for males with degrees in social sciences, for selected occupations



LEGEND

- Government Administrators
- General Managers & Other Senior Officials
- Personnel & Related Officers
- Industrial Engineers

THOUSAND \$
45

THOUSAND \$
45

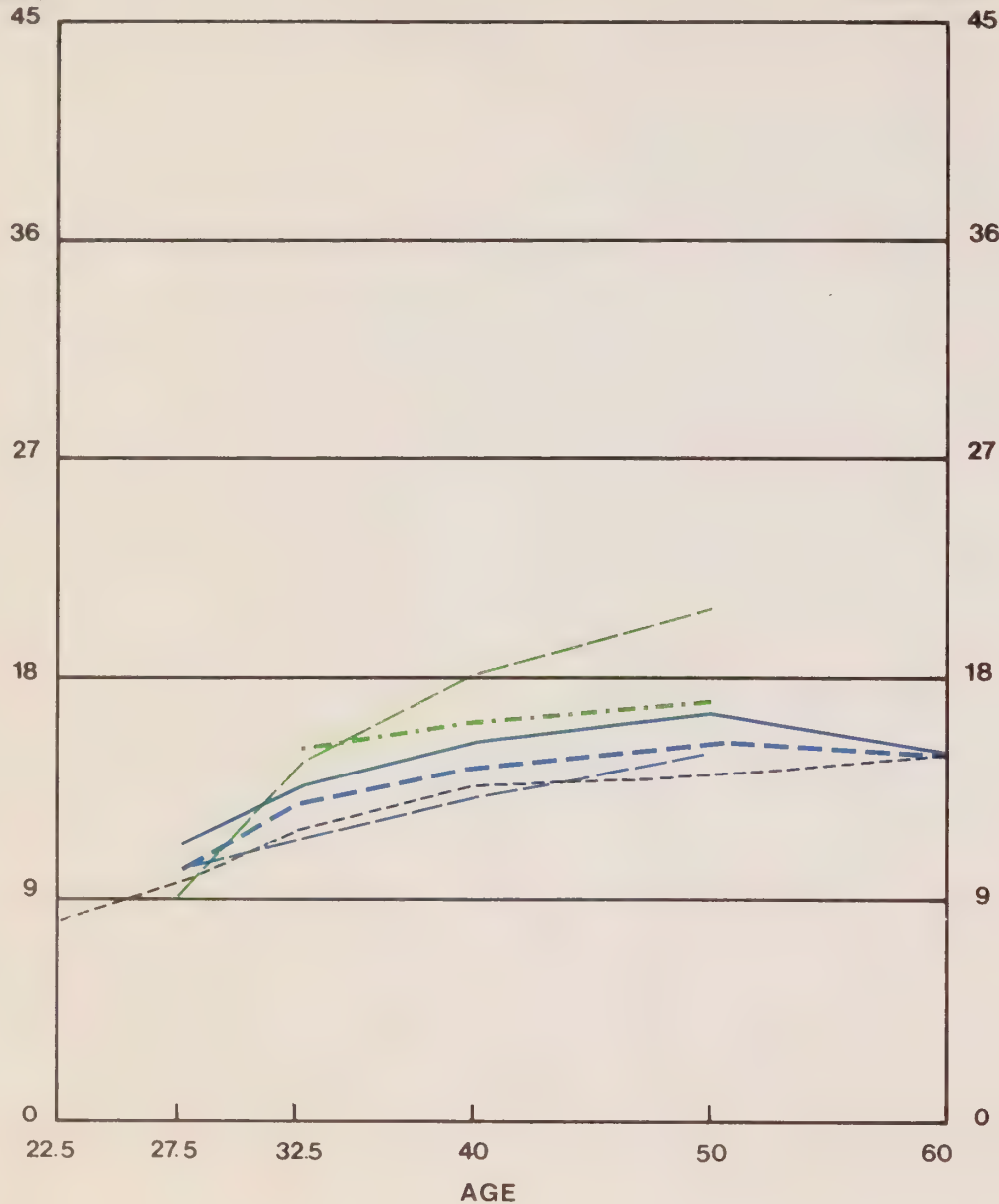


FIGURE IX.13 Age-earnings profiles for males by type of degree, for selected occupations (a)

LEGEND

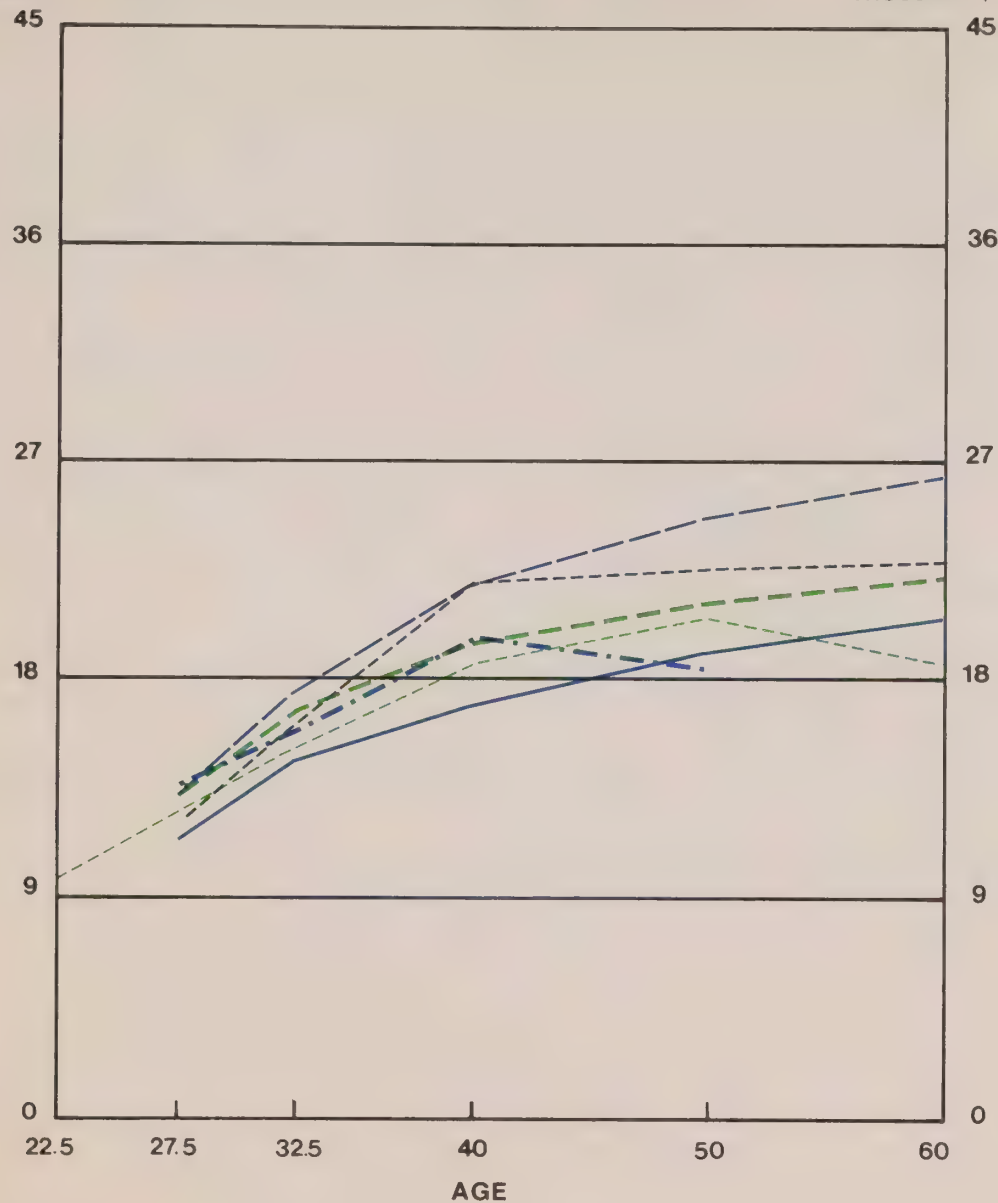
- Secondary School Teachers (Masters)
- - - Secondary School Teachers (Specialised Undergraduate)
- Chemists (Doctorate)
- . - Educational & Vocational Counsellors (Masters)
- - - Educational & Vocational Counsellors (Specialised Undergraduate)
- - - Chemists (Specialised Undergraduate)

NOTE: Type of degree is shown in parentheses

THOUSAND \$

THOUSAND \$

FIGURE IX.14 Age-earnings profiles for males by type of degree, for selected occupations (b)



LEGEND

- Administrators in Teaching & Related Fields (Specialised Undergraduate)
- - - Government Administrators (Specialised Undergraduate)
- . - . - Civil Engineers (Masters)
- - - Civil Engineers (Specialised Undergraduate)
- - - Government Administrators (Masters)
- - - Administrators in Teaching & Related Fields (Masters)

NOTE: Type of degree is shown in parentheses

THOUSAND \$

THOUSAND \$

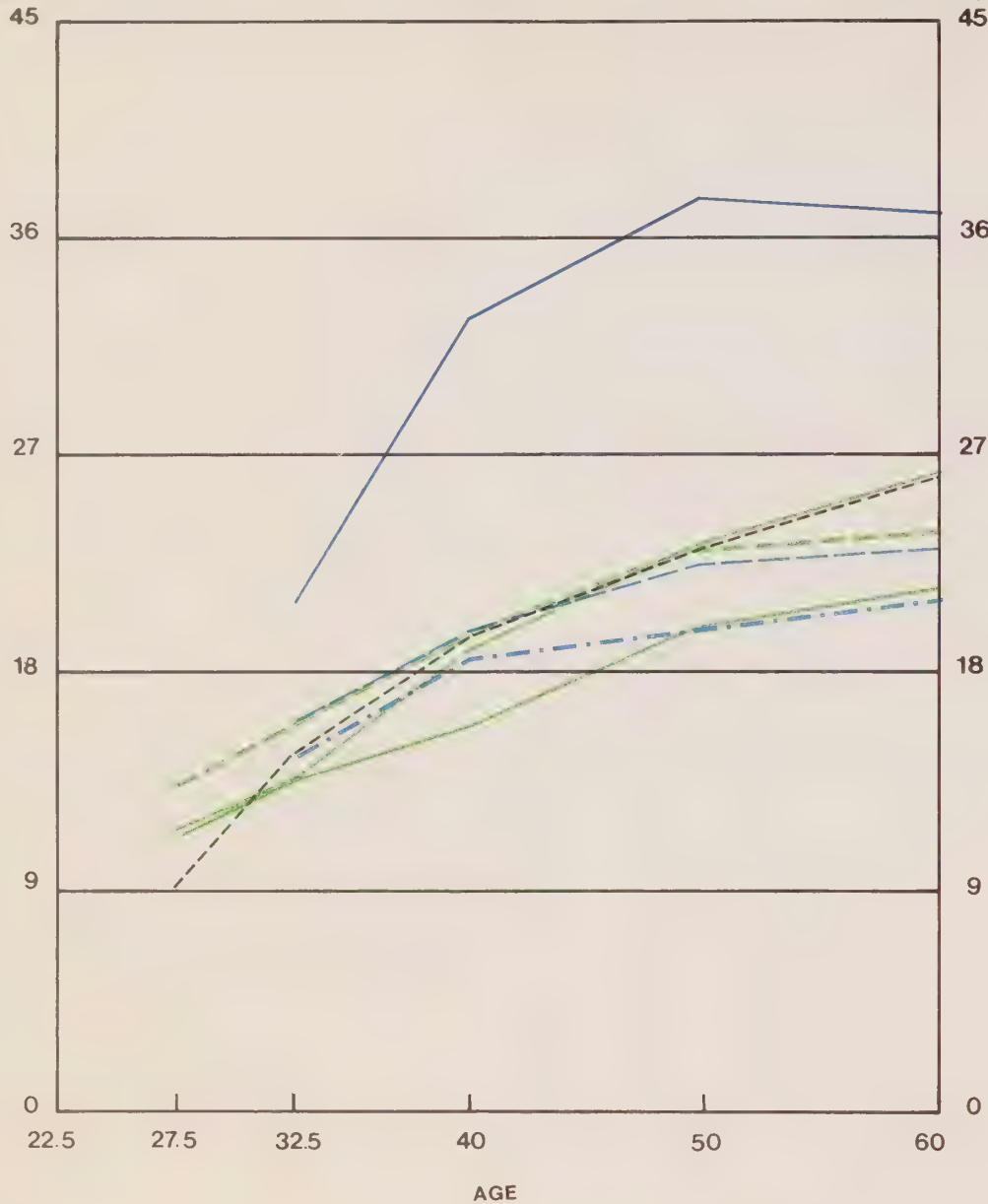


FIGURE IX.15 Age-earnings profiles for male university teachers in specific fields

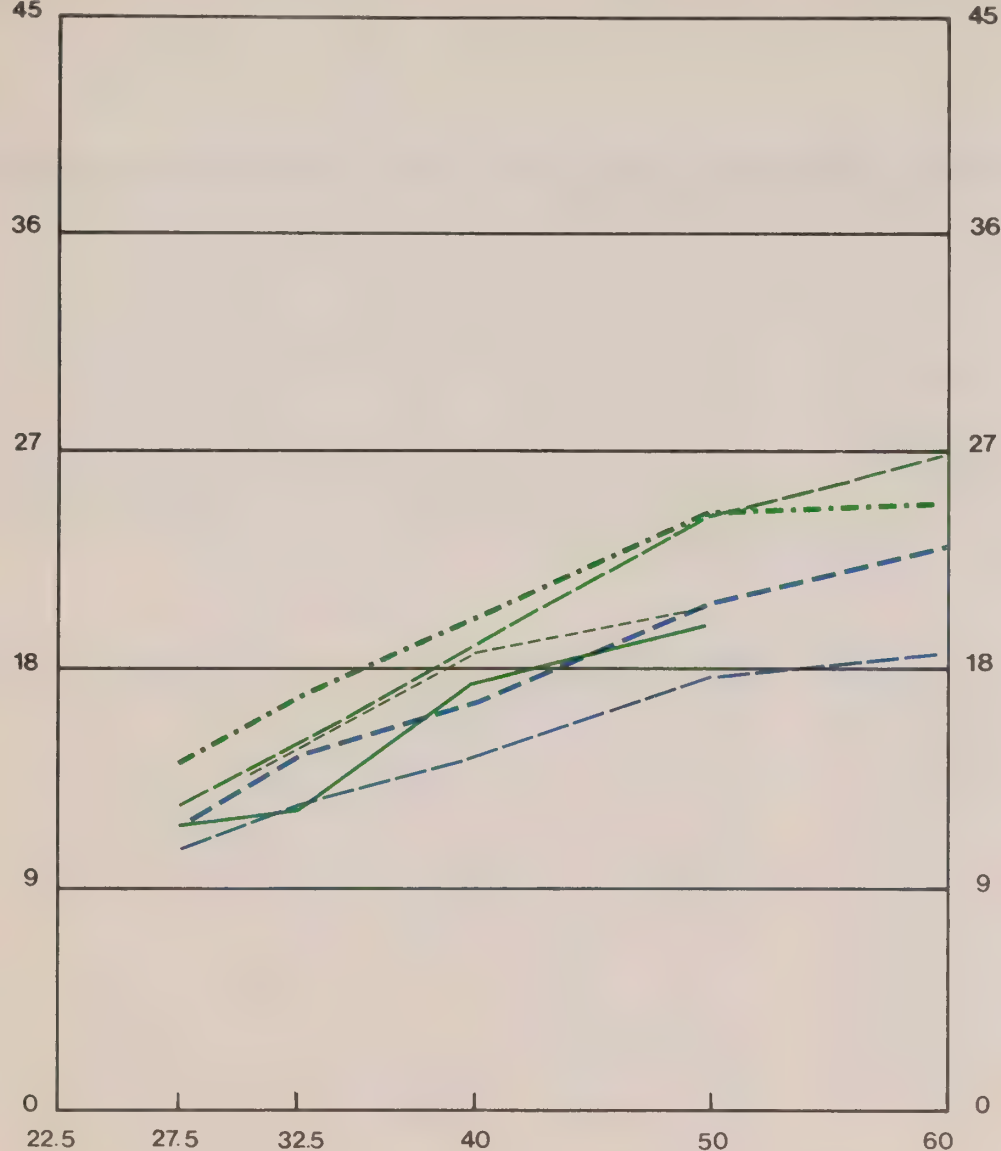
LEGEND

- Education
- Humanities & Related
- Social Sciences & Related
- Agriculture & Biological Sciences (except Health)
- Architecture & Engineering
- Mathematics & Physical Sciences
- Medicine, Dentistry & Health

THOUSAND \$

THOUSAND \$

FIGURE IX.16 Age-earnings profiles for male university teachers, by type of degree



*****LEGEND*****

- Humanities & Related (Doctorate)
- Humanities & Related (Masters)
- . - Social Sciences & Related (Doctorate)
- - - Social Sciences & Related (Masters)
- Mathematics & Physical Sciences (Doctorate)
- Mathematics & Physical Sciences (Masters)

NOTE: Type of degree is shown in parentheses

Chapter X

Some Sex Differentials

Introduction

Some of the differences in the occupations, fields of study and earnings of male and female degree-holders are examined in this chapter. The next section deals with differences in their occupations, and this is followed by a description of differences by field of study and by type of degree. Differences in the earnings of males and females in various occupations are then examined; these are analysed more fully in a section dealing with age-earnings profiles of males and females in selected occupations. The final section of the chapter discusses some of the conclusions of the analysis.

Occupations of male and female degree-holders

Much of the recent literature on the participation of women in the Canadian labour force has shown that there are wide differences in the proportion of men and women in various occupations. For example, in 1971, 32 per cent of females but only 8 per cent of males were employed in clerical occupations; similarly, 2 per cent of females but nearly 6 per cent of males were working in managerial and administrative occupations (see [19]).

There are also wide differences in the occupational distribution of male and female degree-holders (Figure X.1). Thus, 10 per cent of female degree-holders but only 2 per cent of males were employed in clerical occupations in 1973; similarly, 8 per cent of females but 24 per cent of males held managerial or administrative positions. For females, the largest occupation group was elementary and secondary school teaching: 36 per cent of female degree-holders but only 15 per cent of males were working in this group. More specifically, 21 per cent of female degree-holders, and 12 per cent of males, were employed as secondary school teachers; the figures for elementary and kindergarten school teachers were 13 per cent and 2 per cent respectively for females and males.

These data show that there is some occupational concentration for female degree-holders but this is much smaller than that for all females in the labour force (see [3]). Moreover, the extent of concentration appears to be much the same for female and for male degree-holders. Thus, 62 per cent of females were working

in the four largest occupation groups for females, and 59 per cent of males were concentrated in the four largest occupation groups for males. For females these groups were, in descending order of numerical importance, elementary and secondary school teaching, clerical, other health (including nurses, pharmacists, etc.), and managerial and administrative occupations. For males, they were, in descending order, managerial and administrative, elementary and secondary school teaching, architecture and engineering, and health diagnosing occupations. Although the degree of occupational concentration was much the same for males and for females, men were concentrated in more jobs that were highly paid than women.

The data in Figure X.1 may be examined from a different perspective in order to identify the extent of sex-typing of the occupations of degree-holders. The sex distributions of the various occupation groups (Figure X.2) show that males outnumbered females in most of them. Men were particularly dominant (more than 90 per cent of the group) in six occupation groups: architecture and engineering, law, religion, health diagnosing, physical science, and managerial and administrative occupations. Some of these occupations are in fact open only to persons with a specific degree, so that the dominance of males in such occupations may be due to the limited number of females with those degrees. It is also interesting to note that the average incomes in the occupations dominated by males were generally above the average income for all degree-holders (religion was, of course, an exception in this respect).

Females outnumbered males in only four occupation groups: clerical, other health, social work and other social science occupations. In each of these, females formed less than 60 per cent of the total, but the proportion was higher in some cases for the individual occupations within these groups. For example, almost all graduate nurses were female; so too were secretaries and stenographers, and library and file clerks. These were all occupations with low average incomes.

Field of study and type of degree

As noted in Chapter VI, employment in some occupations is determined by field of study, so that the occupational distributions of males and females will in part

TABLE X.1 Female earnings as a proportion of male earnings for selected occupation groups by type of degree (per cent)

Occupation group	DEGREE TYPE				
	Under-graduate	Specialised under-graduate	Masters	Doctorate	All types of degree
Managerial & Administrative	61.4	60.4	73.9	66.4	62.2
Elementary & Secondary School	90.2	88.2	93.6	94.6	88.4
Other Teaching	89.9	83.2	88.5	86.2	83.2
Other Health	68.2	56.7	84.0	-(1)	56.9
Clerical	72.3	69.7	67.2	-(1)	70.6

(1) Excluded because of small numbers.

be determined by their distribution by field of study. The data in Figure X.3 show that there were indeed wide differences in the proportions of males and females who had specialised in different fields of study. For example, nearly 28 per cent of females, but only 14 per cent of males, had specialised in education fields. The humanities have also been popular with women and 22 per cent, compared to 12 per cent for men, had specialised in these fields.

For males, the most popular fields were social science (26 per cent) and architecture and engineering (17 per cent); the proportion of females in each of these fields was much smaller — 16 per cent and 1 per cent respectively.

These figures clearly demonstrate that the educational choices of women have played an important part in determining the occupations in which they work. For example, nearly half of all female graduates had specialised in education or humanities: since many persons in these fields had entered teaching occupations (see Chapter VI), it is not surprising that a large proportion of women were in fact working in such occupations. Similarly, a negligible proportion of women had specialised in architecture and engineering so that the proportion of women working in these occupations would also be expected to be small.

There are of course many possible explanations for the differences in male and female educational choices. For example, women may choose fields of study which provide greater opportunities for part-time employment or for employment in the traditional female occupations; consequently occupational preferences may affect educational choices. Alternatively, women may face discrimination in fields which have traditionally been male-dominated, so that they may not gain access to certain fields. A third possibility is that women might have been less concerned with the profitability of university education and might have therefore shown less preference than men for fields of study which lead to high-income occupations.

The data in Figure X.4 show that females outnumbered males only in the relatively small field of fine arts. In education, humanities and general arts and science, the number of females was somewhat smaller than the number of males. Men outnumbered women in architecture and engineering, health and mathematics and physical science fields: these are generally associated with specific occupations which often have higher than average incomes.

There was also considerable difference in the types of degree held by men and women (Figure X.5). The ratio of females to males was highest for general undergraduate degrees, and it fell consistently as the level of degree increased. Only 9 per cent of those with doctorates, and 10 per cent of those with a first professional degree in medicine, law or veterinary science, were female.

This pattern is consistent with the explanations for the educational choices of women discussed above. Women may be discouraged from taking higher degrees because of discrimination or because of the higher investment costs, of both time and money, of higher degrees.

Earnings differences by occupation

The data in the preceding section suggest that women tend to choose different fields of study than men, so that the employment opportunities open to men and women will be different. Since average earnings vary considerably by occupation (see Chapter IX), it follows that the earnings of men and women may be quite different. Thus the different educational choices of males and females will tend to generate earnings differentials between them.

However, there appear to be wide differences in the earnings of males and females within a given occupation. The earnings of males and females who worked in a full time job for 40 or more weeks in the twelve months prior to the survey, which roughly correspond to calendar year 1973, are compared for different occupation groups in Figure X.6. The data show clearly that women earned substantially less than men in all occupation groups. Female earnings formed roughly two-thirds of male earnings over all occupations, but the ratio varied markedly from one occupation group to the other: it varied from a low of 56 per cent for lawyers to a high of 91 per cent for social workers.

Another interesting observation about the male-female earnings differentials of degree-holders is that the proportion that female earnings formed of male earnings tends to be relatively low for occupations in which average earnings were relatively high, and vice versa. For example, for lawyers and notaries, with average male earnings of \$26,000, female earnings formed 56 per cent of male earnings; by contrast, average earnings for male social workers were \$11,000, and female earnings were 91 per cent of male earnings. Thus it appears that differences in male and female earnings widen as the level of earnings increases.

The data in Figure X.6 also suggest that earnings differentials tend to be relatively low in occupations in which the proportion of females is relatively high, and vice versa. For example, male and female earnings for elementary and secondary school teachers were fairly similar and so too were the numbers of males and females; by contrast, males were dominant in health diagnosing

occupations and males and females had quite different earnings.

The data in Table X.1 show the proportion that female earnings formed of male earnings by type of degree in the five largest occupation groups for women. There is indeed some variation by degree type, but there does not appear to be a systematic pattern for all occupations. For example, for elementary and secondary school teachers the proportion increases with the level of degree; by contrast, for clerical occupations it is lower for those with a masters degree than for those with an undergraduate degree.

The variation in the proportion is also almost as large for any particular type of degree as for all degrees. This suggests that differences in the types of degree held by men and women may explain only a small part of the observed male-female earnings differentials.

Age-Earnings Profiles

The data in Figures X.7 through X.10 show age-earnings profiles for males and females for selected individual occupations. Individual occupations were chosen for analysis instead of the occupation groups analysed earlier in this chapter in an attempt to eliminate any earnings differentials which may be due simply to the variation in the sex composition of individual occupations within the groups. For example, general managers were predominantly male so that the high earnings reported by them would have introduced a bias in the male-female earnings differential for the managerial and administrative occupation group, which includes general managers.

The data refer only to persons who worked in a full-time job for 40 or more weeks in the twelve months period prior to the survey, so that the effects of part-time employment have been eliminated. Note, however, that the effects of differences in work experience have not been eliminated in this way.

As noted in Chapter IX, these age-earnings profiles simply show the average (mean) earnings reported by persons of different age groups. The points plotted on the graphs are the mid-points of the age groups used. Only groups with 100 or more persons are included on the graphs and the gaps in the graphs represent averages based on small numbers. Generally, age-earnings profiles based on cross-section data have a common shape: earnings increase fairly rapidly over the first half of the working life and then often decline before retirement age.

The data in Figures X.7 and X.8 show that males earned substantially more than females in all occupations shown and for almost all ages. The difference between the sexes was fairly large at all ages for physicians and surgeons; the smallest difference was for those aged 25-29 — female doctors earned about \$5,000 less than males. Since the earnings of physicians and surgeons usually depend on the number of patients seen and hence on hours worked, the difference could be due to differences in hours worked if female doctors worked fewer hours than male doctors.

There also seems to be a tendency for the sex differential in earnings to vary with both the level of earnings and with age. Thus, the differential appears to be

greater at all ages for physicians and surgeons, administrators in teaching fields and university teachers (all with fairly high incomes) than for social workers, other post-secondary teachers and librarians and archivists (all with lower incomes). The difference in male and female earnings was larger for older age-groups than that for younger age groups in some occupations; for example, for administrators in teaching fields, male earnings exceeded female earnings by about \$5,000 for those aged 55-64 but by about \$2,000 for those aged 25-29.

The fact that earnings differentials vary with age is not altogether surprising. As suggested in Chapter XI, related working experience appears to be an important determinant of earnings. Since some women would have spent some of their working lives out of the labour force, the average number of years worked by women of a particular age group would be less than that for men of the same age-group. As noted in Chapter III, female participation in the labour force on a full-time basis also varied with age so that the effects of working experience will differ by age. Thus, male and female earnings will differ by varying amounts at different ages.

The effects of related working experience cannot be eliminated from the data so that there is no simple way to determine the effects, if any, of sex discrimination by employers in the labour market for degree-holders. However, it is clear that the effects of related working experience will be at a minimum for the youngest age groups when both men and women would have had little related experience. The data in Figures X.7 and X.8 show that there are in fact earnings differentials for the age group 25-29, but these are in some cases fairly small: in two cases, social workers and librarians and archivists, the earnings of females actually exceeded those of males for this age group.

The age-earnings profiles examined so far have ignored the effects of major field of study and type of degree. However, the conclusions above seem to hold good even after controlling for these variables. As an example, consider the age-earnings profiles shown in Figure X.9 for selected occupations but only for persons who had specialised in education fields. Male earnings exceeded female earnings in all occupations and age-groups with one exception: for elementary school teachers the reverse was true for those aged 55-64. The earnings differential also varied with age and it was smallest for the youngest degree-holders. In the case of both elementary and secondary school teachers data are also shown for those under 25 years of age. Even for this age group when the effects of related experience should be small, male earnings still exceeded female earnings, although by only a very small margin.

The data in Figure X.10 show the profiles for specific occupations and types of degree, and the conclusions are much the same. Thus for secondary school teachers with a specialised undergraduate degree in education, male earnings exceeded female earnings at all ages; here too there was a small differential for those under 25 years of age. For social workers with a masters degree male-female earnings differentials also existed except for those aged 25-29. In the case of administrators in teaching fields with a specialised undergraduate degree in education, the differential also increased for the older age groups.

Conclusions

The analysis in this chapter suggests that there are wide differences in the fields of study and occupations of male and female degree-holders. Males outnumbered females in most fields of study and in some cases the proportion of females was very small indeed. For example, the proportion of females in such fields of study as medicine, law and engineering was relatively low. Graduation in these fields is a requirement for employment in the corresponding occupations so that the relatively low proportion of female graduates in such fields has clearly affected the proportion of females in the corresponding occupations.

The proportion of women in occupations which are only loosely related to field of study does, however, vary considerably from one occupation to the other. For example, the proportion of women in the managerial and administrative group of occupations was relatively small; by contrast, women outnumbered men in clerical occupations. In general, the proportion of women in the relatively high paying occupations seemed to be low. This suggests that some of the differences in the average earnings of male and female degree-holders may be due to differences in the occupations in which they find employment.

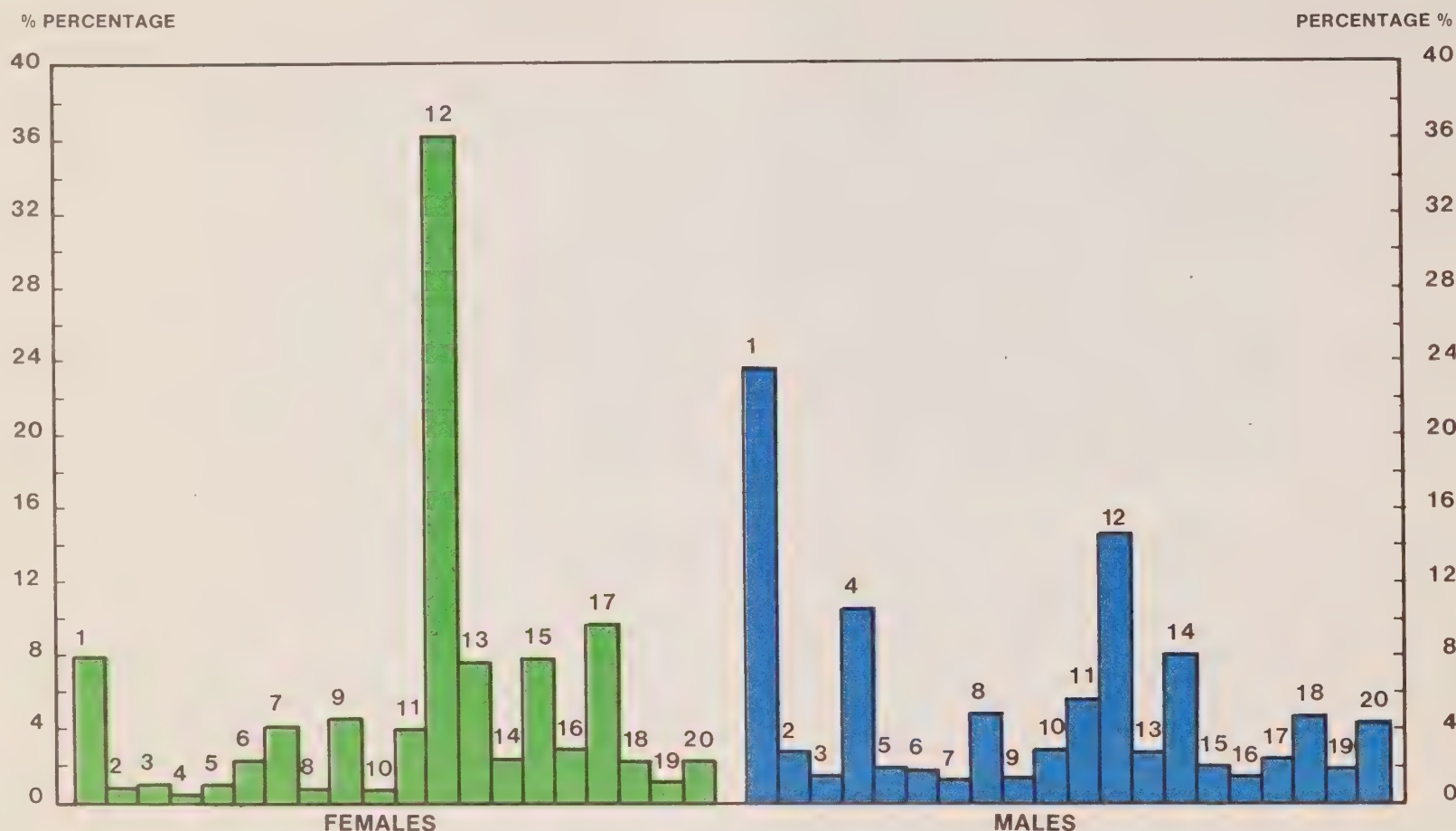
However, comparison of the average earnings of males and females in the various occupation groups showed that in some cases they differed considerably. These differences were examined more closely by comparing the age-earnings profiles of males and females in selected specific occupations. It was found, in some cases, that earnings differentials existed at all ages and that they had a tendency to increase with age.

There are several possible explanations for those differences. It is possible, for example, that they are due to differences in the working experience and career patterns of men and women. Many women interrupt their careers for family reasons and this may have an effect on their earnings. This issue could not be properly examined with the available data. However, an attempt was made to explore its importance in some cases by examining the earnings differential for young degree-holders, for whom the effects of working experience and interrupted careers should be small. It was found that the earnings of males sometimes still exceeded those of females, but the differences were relatively small.

A second possibility is that women work fewer hours than men and hence earn lower incomes. This may well be the case in occupations such as health diagnosing or law in which individuals can often choose their hours of work. However, it is probably not the case in the majority of occupations.

A third possibility is that employers discriminate financially against women in the labour market. This hypothesis could not be properly examined with the available data, but there is some indirect evidence that this may be the case. For example, employers may find it easier to pay women less than men in occupations for which the supply of male labour is relatively high; this may explain why the earnings and the proportion of women in a given occupation appear to be related. This issue does, however, require much more detailed analysis than has been possible in this report.

FIGURE X.1 Occupational distribution by sex



1. Managerial, Administrative & Related Occupations
2. Occupations in Physical Sciences
3. Occupations in Life Science
4. Occupations in Architecture & Engineering
5. Occupations in Mathematics, Statistics, Systems Analysis & Related Fields
6. Occupations in Social Sciences & Related Fields, n.e.c.
7. Occupations in Social Work & Related Fields

8. Occupations in Law & Jurisprudence
9. Other Occupations in Social Sciences & Related Fields, n.e.c.
10. Occupations in Religion
11. University Teaching & Related Occupations
12. Elementary & Secondary School Teaching & Related Occupations
13. Other Teaching & Related Occupations
14. Health Diagnosing & Treating Occupations
15. Other Occupations in Medicine & Health

16. Artistic & Literary, Recreational & Related Occupations
17. Clerical & Related Occupations
18. Sales Occupations
19. Service Occupations
20. Other Occupations

FIGURE X.2 Sex composition of occupation groups

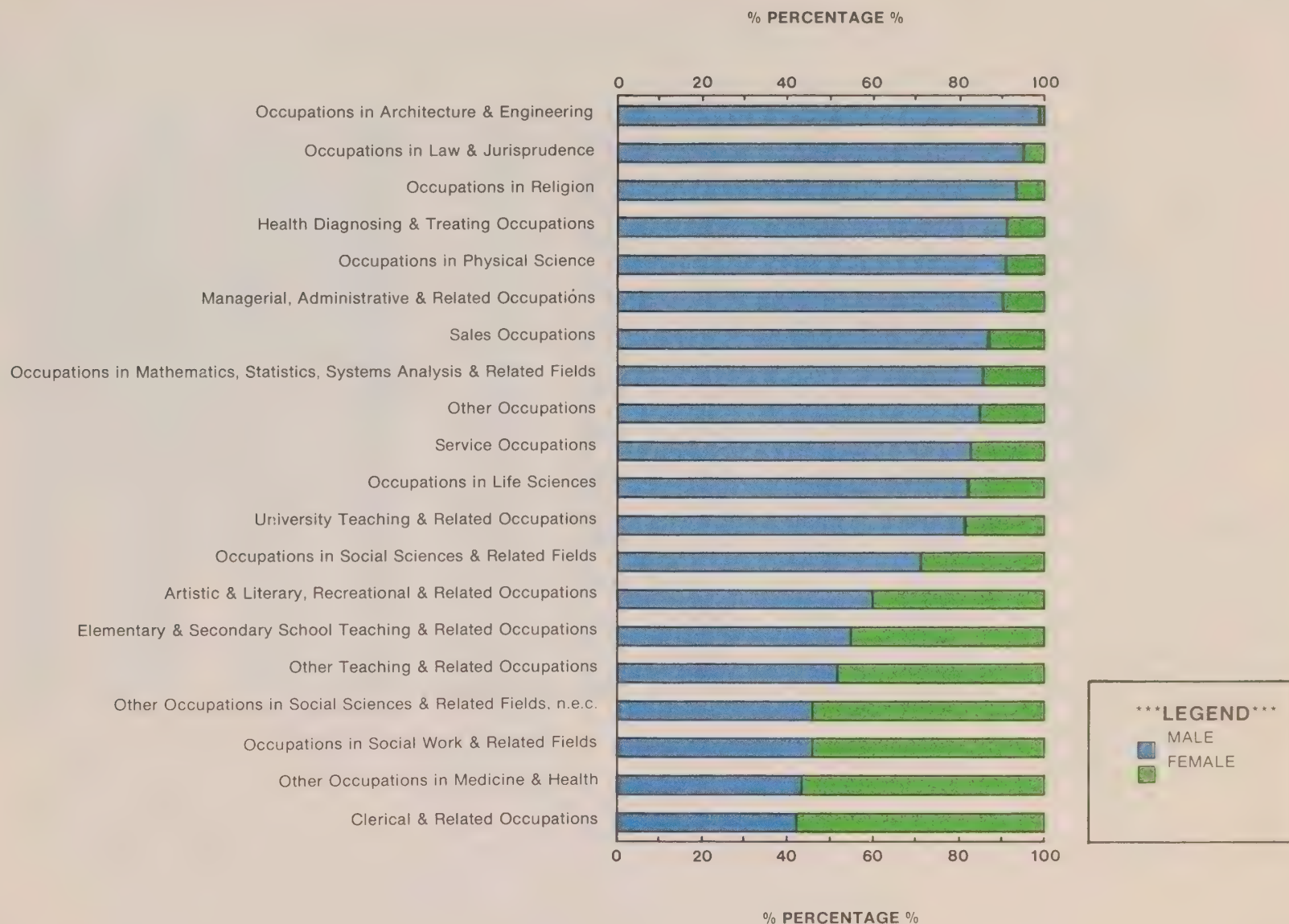


FIGURE X.3 Distribution of degree-holders by major field of study, by sex

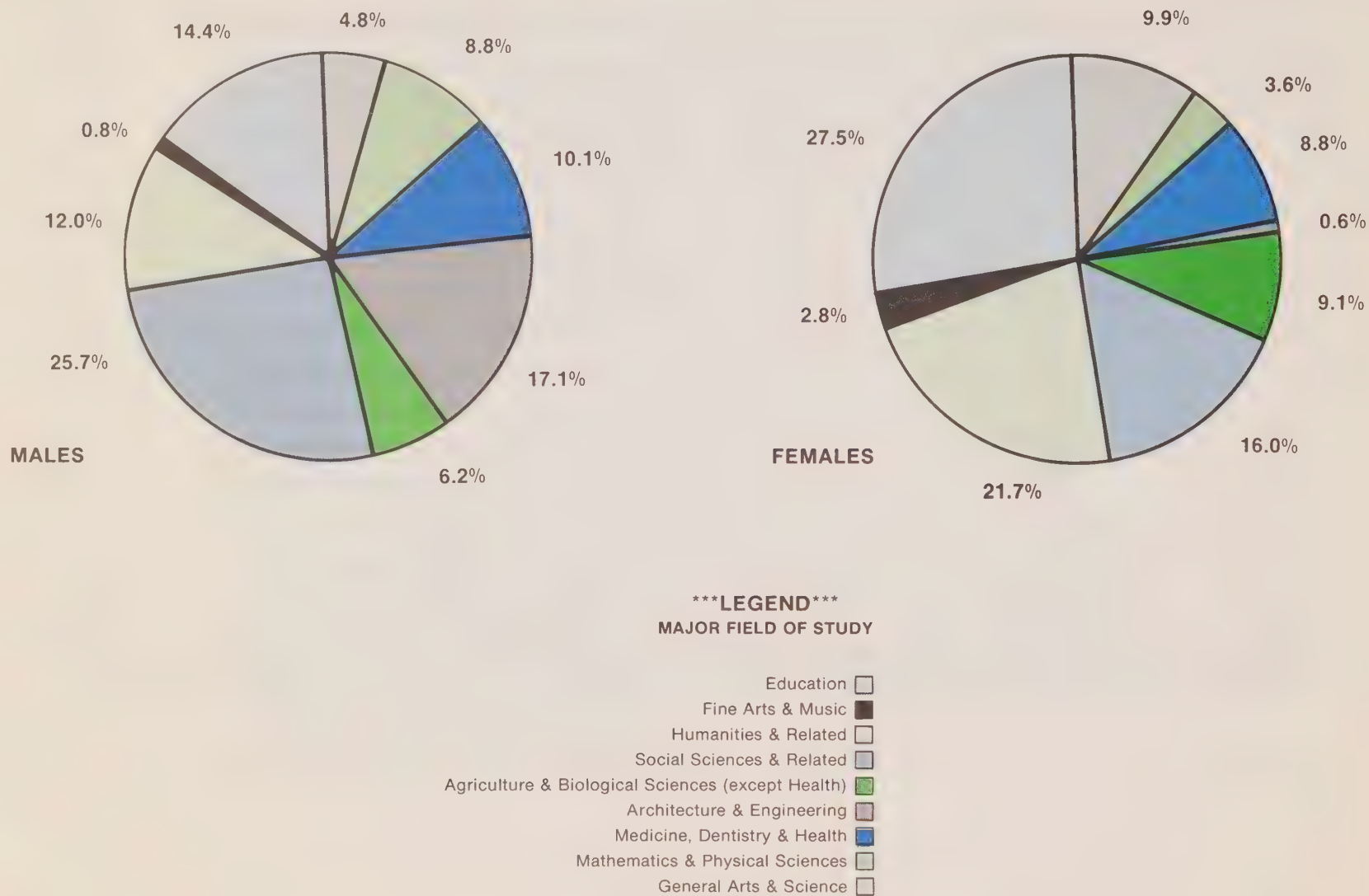


FIGURE X.4 Sex composition of highest degree, by major field of study

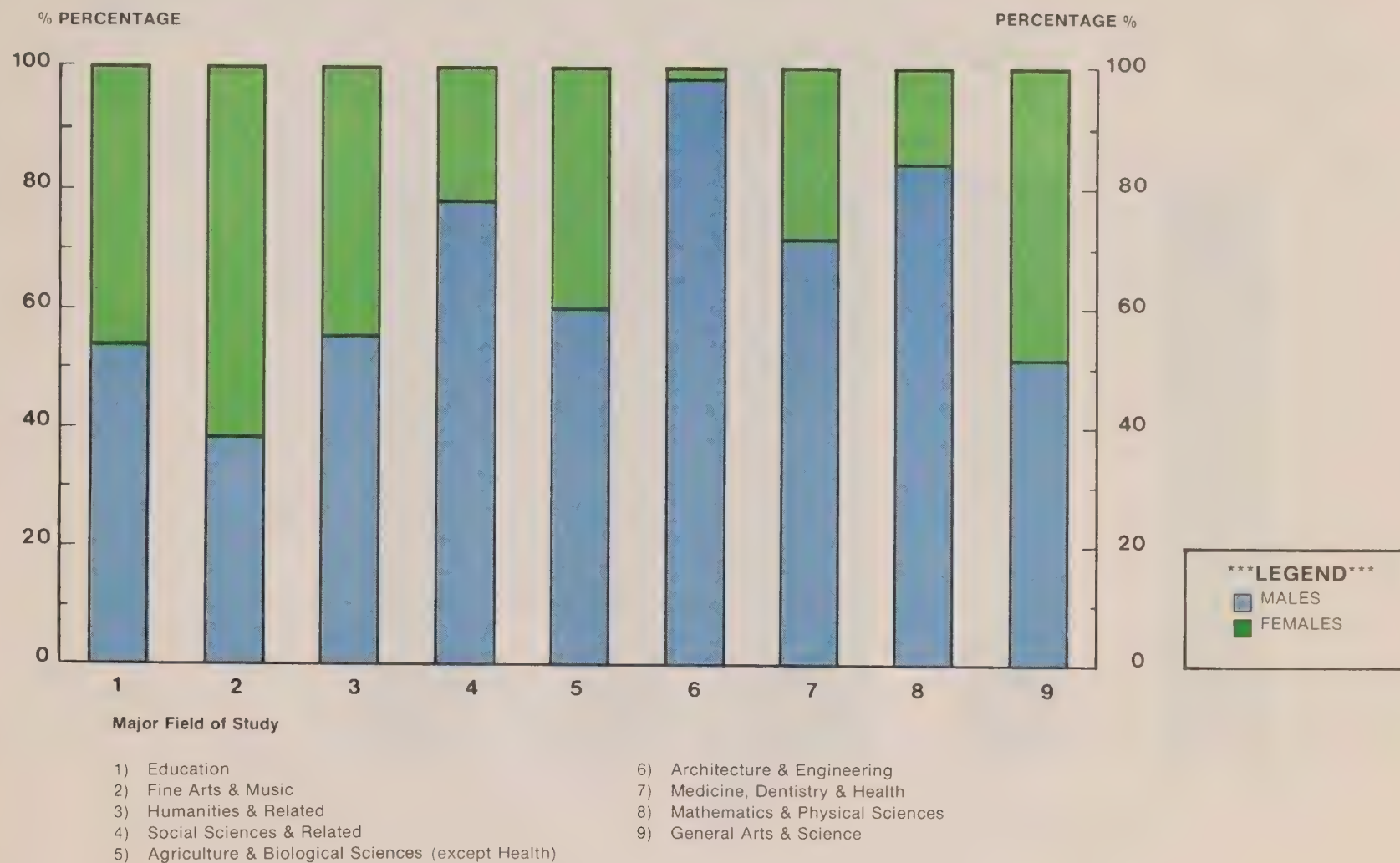


FIGURE X.5 Sex composition, by type of degree

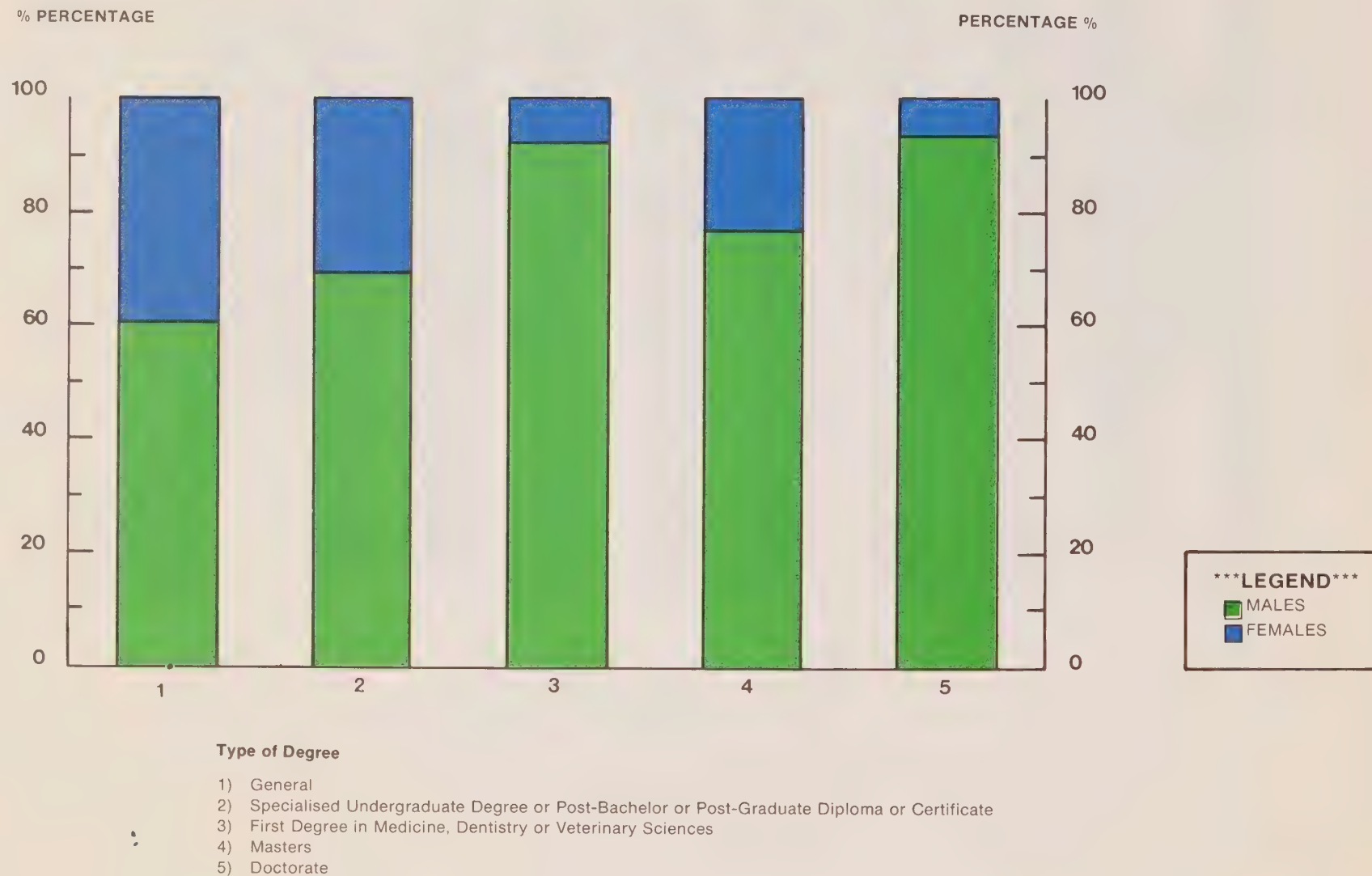
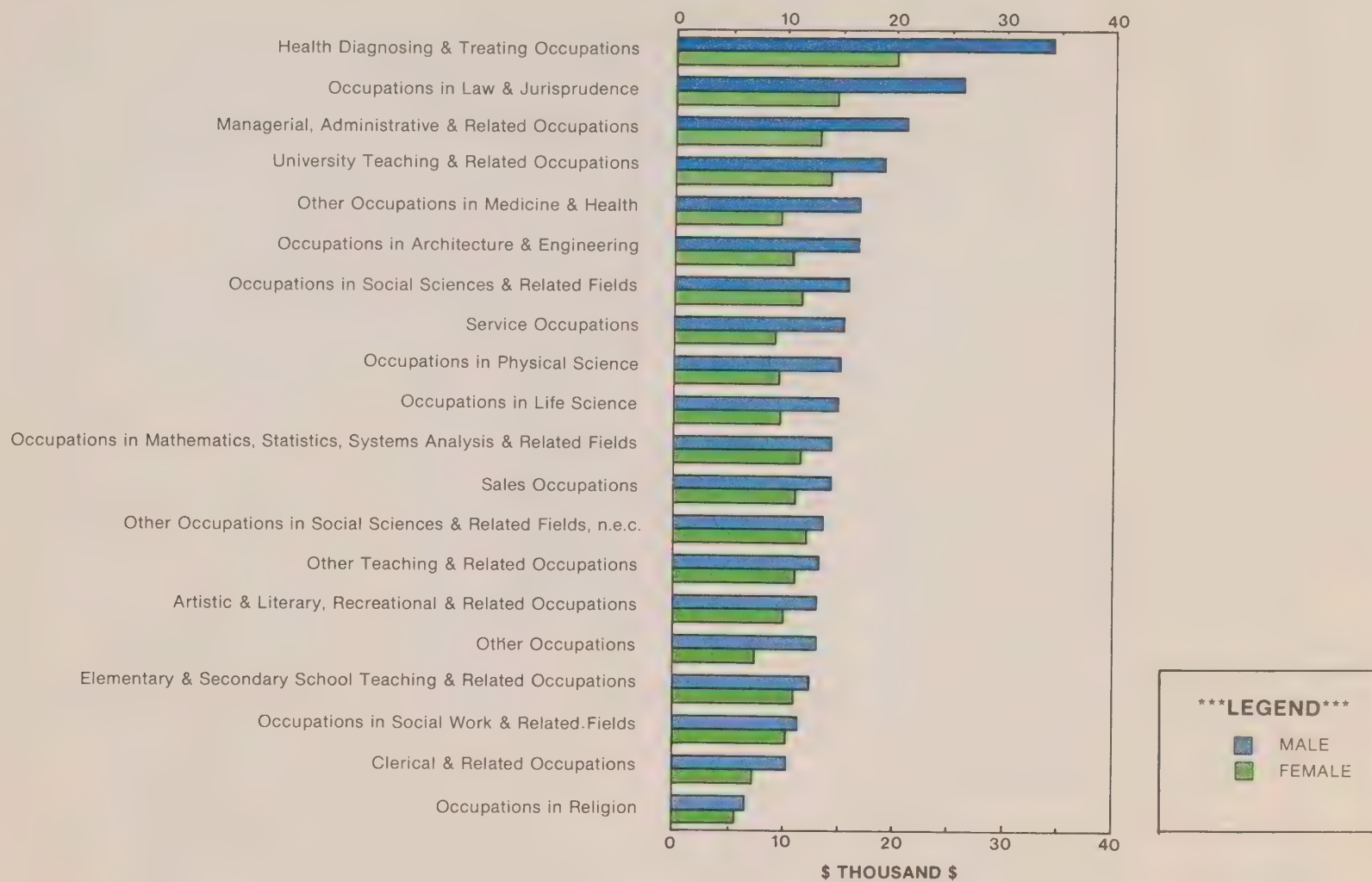


FIGURE X.6 Average (mean) earnings (1973) by occupation group & sex



THOUSAND \$

THOUSAND \$

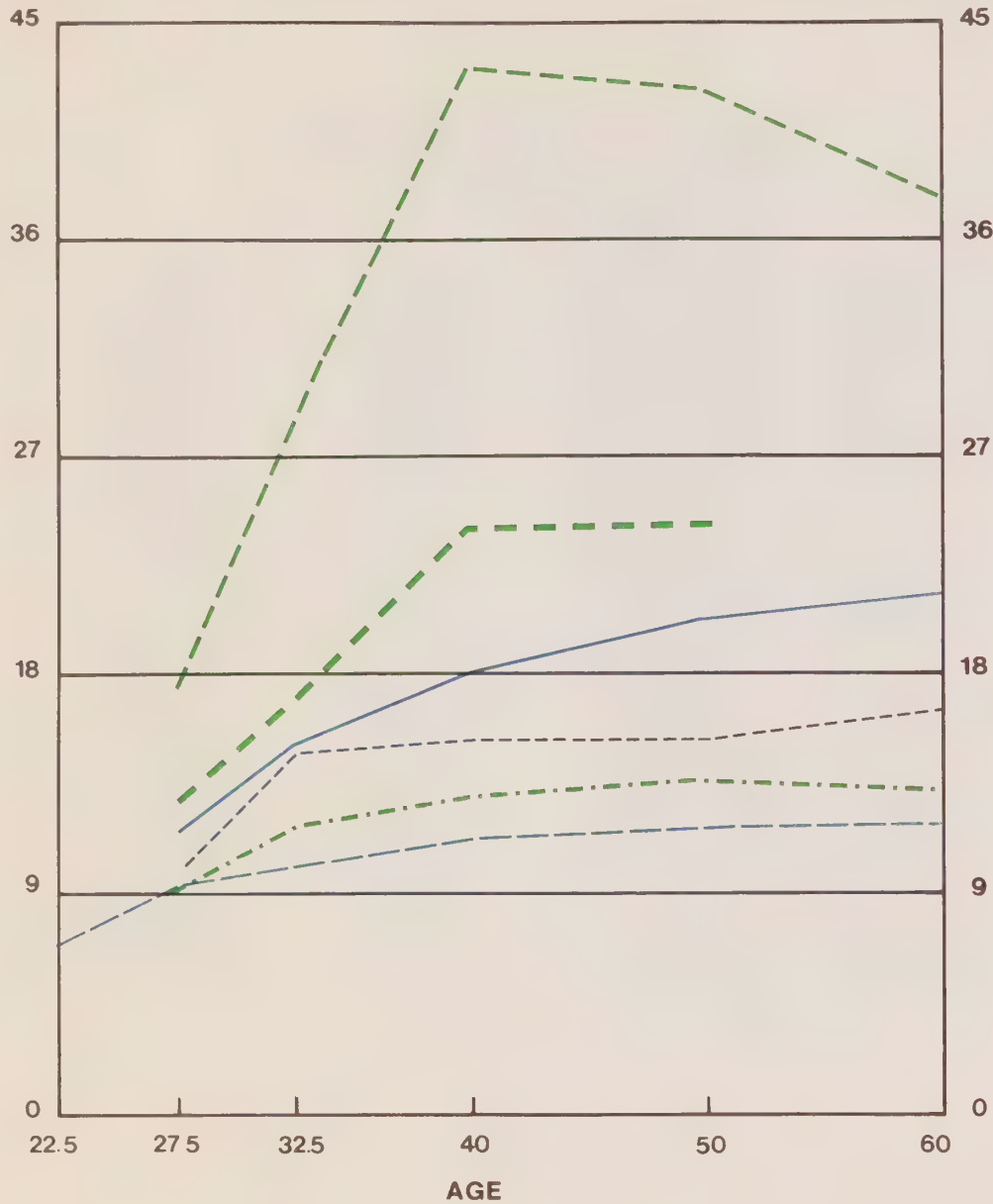


FIGURE X.7 Age-earnings profiles for males and females in selected occupations(a)

LEGEND

- Administrators in Teaching & Related fields (Male)
- - - Administrators in Teaching & Related fields (Female)
- . - . - Social Workers (Male)
- - - Social Workers (Female)
- - - Physicians & Surgeons (Male)
- - - Physicians & Surgeons (Female)

THOUSAND \$

THOUSAND \$

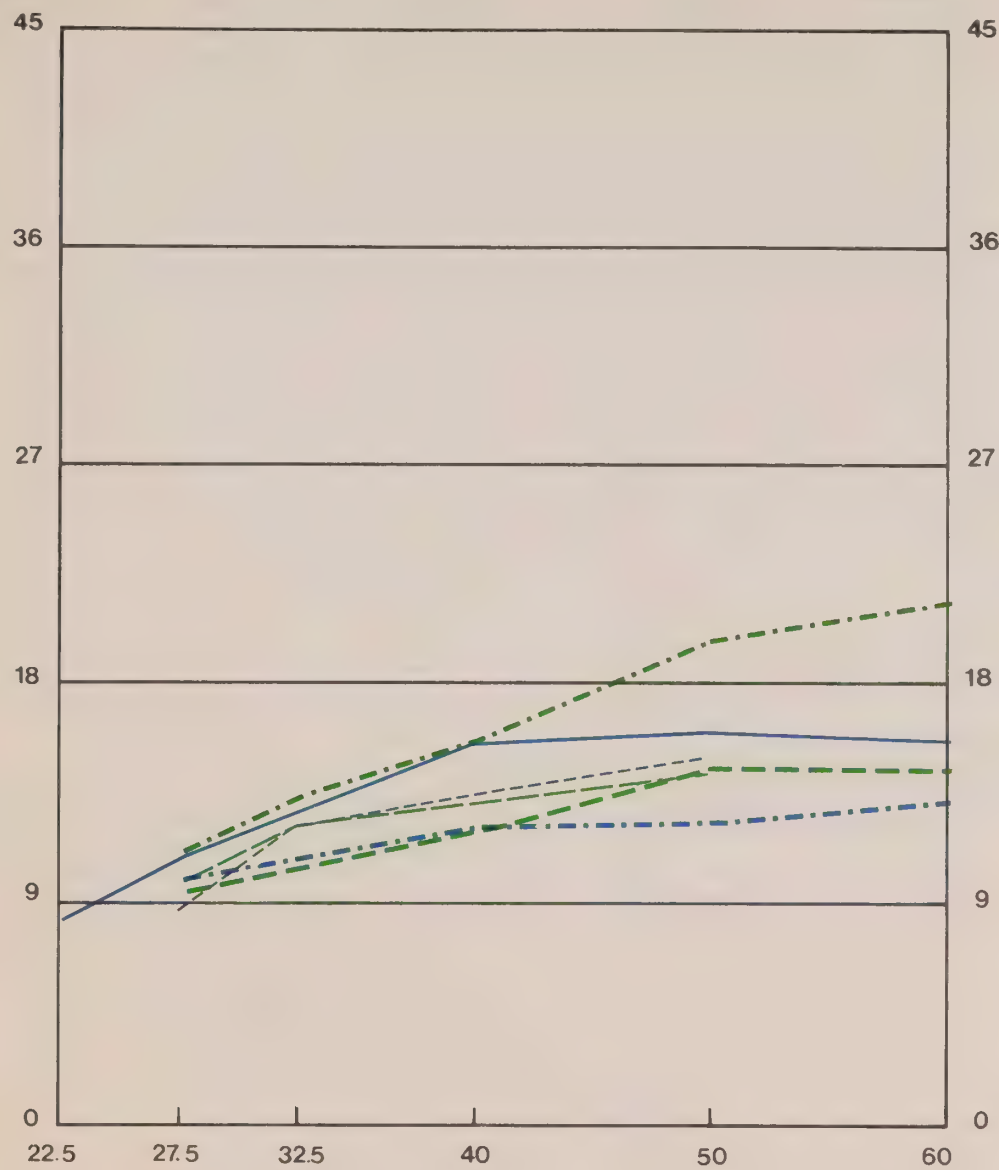


FIGURE X.8 Age-earnings profiles for males and females in selected occupations(b)

LEGEND

- Post-Secondary School Teachers, n.e.c. (Male)
- - - Post-Secondary School Teachers, n.e.c. (Female)
- . - . University Teachers (Male)
- . . . University Teachers (Female)
- - - Librarians & Archivists (Male)
- . - . Librarians & Archivists (Female)

THOUSAND \$

THOUSAND \$

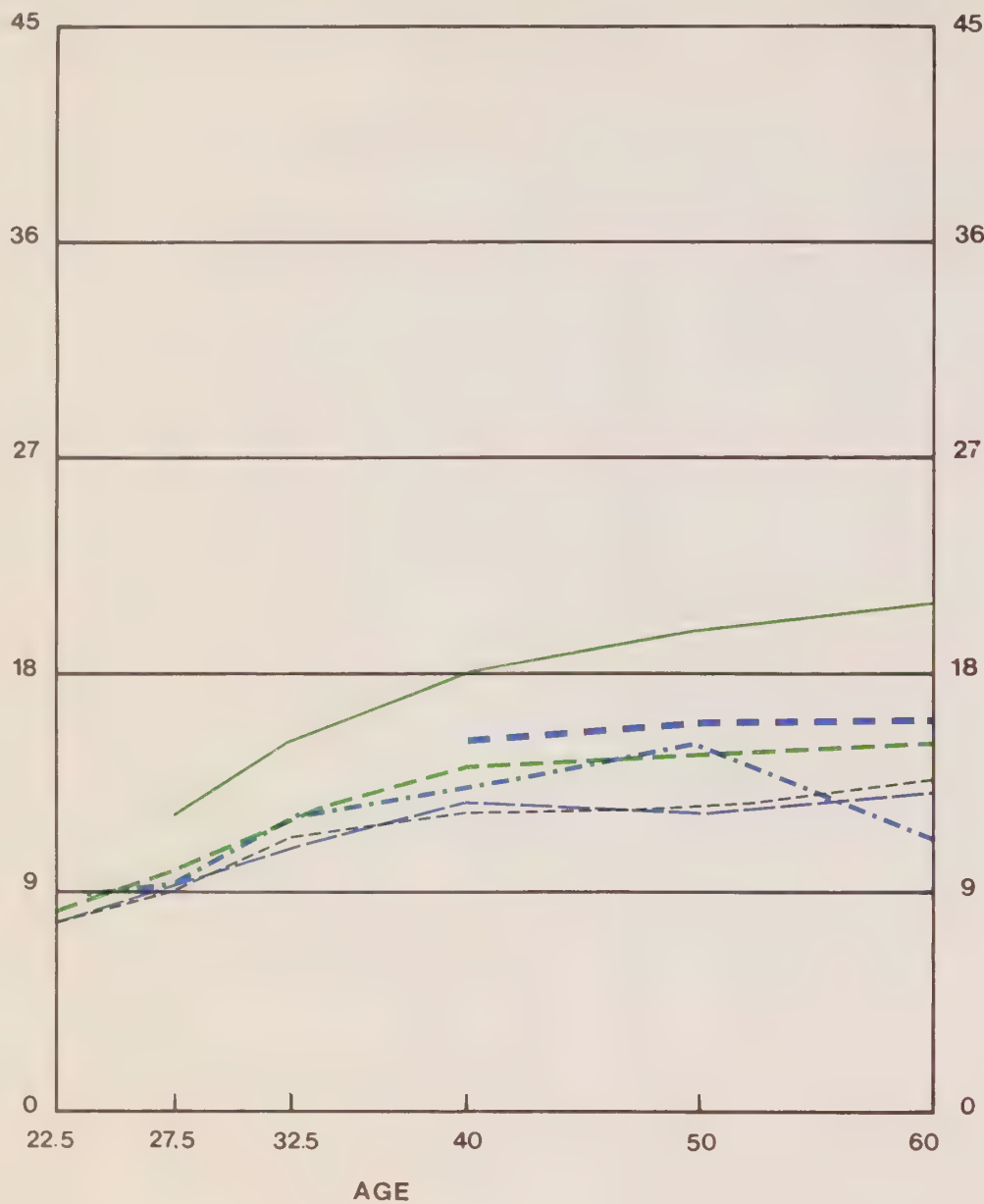


FIGURE X.9 Age-earnings profiles for males and females with degrees in education, for selected occupations

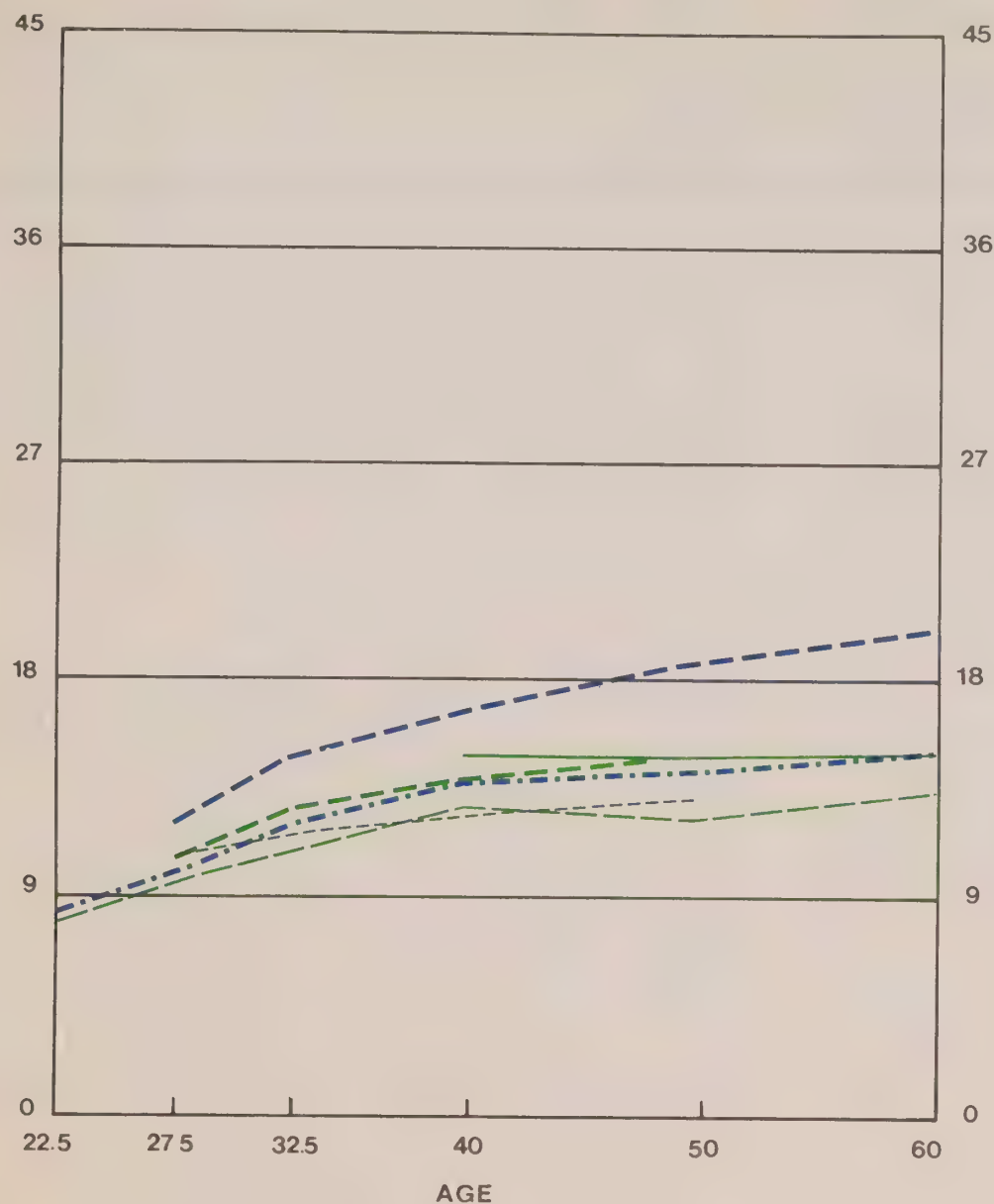
LEGEND

- Administrators in Teaching & Related Fields (Male)
- - Administrators in Teaching & Related Fields (Female)
- . - Elementary & Kindergarten School Teachers (Male)
- - - Elementary & Kindergarten School Teachers (Female)
- - - Secondary School Teachers (Male)
- . - Secondary School Teachers (Female)

THOUSAND \$

THOUSAND \$

FIGURE X.10 Age-earnings profiles for males and females with a masters degree, for selected occupations



LEGEND

- Social Workers (Male)
- Social Workers (Female)
- .- Secondary School Teachers (Male)
- .- Secondary School Teachers (Female)
- .- Administrators in Teaching & Related Fields (Male)
- Administrators in Teaching & Related Fields (Female)

Chapter XI

Estimated Earnings Functions by Age

Introduction

The analysis in the two preceding chapters suggests that the earnings of degree-holders in Canada are determined by a wide range of factors. The importance of the various factors was examined using purely descriptive techniques; thus the earnings of different types of degree-holders were compared for a given factor while controlling for others. For example, age-earnings profiles for male and female doctors who worked in a full-time job for 40 or more weeks in the year prior to the survey were compared as part of the analysis of earnings differences by sex: the intention was to remove the effects of occupation, age and employment status so that the effects of sex could be examined. While this type of analysis is useful for exploring the effects of the most important factors, it is of limited value when a large number of factors is involved.

The importance of the various factors may also be investigated using statistical techniques. In this case, the first step is to formulate a theoretical relationship or model which includes a comprehensive set of both qualitative and quantitative factors which determine the earnings of an individual. The second step is to set up the model in mathematical form so that the coefficients of the variables which determine earnings can be estimated by statistical analysis. Finally, the estimated coefficients are appraised in a variety of ways including statistical tests of significance.

Such a model of earnings may have a variety of uses. The estimated coefficients provide quantitative estimates of the contribution of the various variables to differences in earnings, and hence they may be used to derive estimates of the relative importance of different factors in generating earnings differentials. The model may also be used to predict the level of earnings of different groups of degree-holders, assuming of course that it can be expected to hold good over the prediction period. It can also be used to derive estimated age-earnings profiles which can be used to provide estimates of the profitability of different types of education.

This chapter deals with the specification and estimation of a model for the earnings of degree-holders in Canada. The next section outlines some of the

considerations which were necessary in formulating the model, followed by a section on the mathematical formulation of the model, and by one on the data used for the regression analysis. These are followed by a section on the interpretation of the results, which are used to provide a better understanding of the factors which generate differences in earnings. The final section of the chapter presents the main conclusions of the analysis.

The analysis in this chapter is necessarily quite technical, but an attempt has been made to keep the discussion fairly simple. A more technical description of the results is also available elsewhere (see [18]).

Some basic considerations

The human capital model, initially developed by Becker [6], provides an economic explanation of differences in earnings by education. The model treats educational expenditures as investments which yield returns in the form of future earnings: thus, it assumes that individuals are willing to invest in their education if they expect that they will be compensated through higher earnings in the future. The cost of the investment includes fees and other expenses, as well as the income foregone in the training period. Since income foregone usually forms a large proportion of the total cost of a degree, it is not surprising that investment costs will be closely related to the length of the training period. It follows that if students receive adequate compensation for their educational investment, their returns, and hence their earnings, will depend on the length of the training period. For example, the model predicts that if the labour market works efficiently, the earnings of a medical graduate will tend to be higher than those of an arts graduate because of the different lengths of the training period. Similarly, doctorate-holders go through a longer training period than persons with undergraduate degrees so that their earnings will tend to be higher as well.

The slope of age-earnings profiles can also be explained by the human capital model. The model predicts that the profiles for persons with a higher level of investment in education will be steeper and will reach a peak at a higher age than those for persons with less investment in education; empirical analysis tends to support this prediction (see [23]).

The human capital model does not, however, provide a satisfactory explanation for all the observed variation in earnings. For example, the model predicts that if labour markets work efficiently, persons with identical investments in education will have identical age-earnings profiles; but this is clearly not the case in practice, since earnings for persons with the same educational attainment differ considerably (see Chapter IX). Similarly, the model does not take account of the role of learning by doing (on-the-job training) or of related work experience, which may have no costs, on the future earnings of individuals (see [24] for a detailed discussion of the model).

Individuals with identical education but working in different labour markets may have widely different earnings for a number of reasons. It may be the case, for example, that the quality of the education received by different individuals differs significantly so that measures of educational achievement need to be standardised for quality differences before earnings can be compared. However, although it is likely that differences in quality do exist, there is no reason to expect that their effects will vary substantially from one occupation to the next (see [16] for some U.S. evidence in this respect).

Differences in innate ability or intelligence have also been suggested as a possible reason for observed differences in earnings. However, it is difficult to find an adequate measure of ability for use in models of earnings, and there has been much controversy about the results of studies which have tried to estimate its effects.

Family background or socio-economic status may also affect the jobs of individuals and hence their earnings. For example, in the U.S., graduates in the professional fields tend to be drawn from families with higher socio-economic status, and their earnings may be higher for this reason. Similarly, graduates from business schools appear to be drawn from lower socio-economic groups than other university graduates, so that their incomes would be expected to be lower to reflect the effects of socio-economic status (see [16]).

Earnings may also vary between occupations if individuals undertake additional investments in skill development at the end of their formal education. This investment may take the form of individuals receiving lower earnings at the start of their career and higher earnings after the training period; the internship of new doctors provides an obvious example of this. Individuals in different occupations may also undertake some form of training or retraining at some time in their working lives, and this may generate differences in occupational earnings. However, there is little evidence in Canada to suggest that these practices are widespread.

Imperfections in the labour market may also cause differences in the earnings in various occupations. For example, if the supply of persons to a given occupation is restricted by law or by a professional association or union, the earnings of persons in that occupation may well be above the free market wage. There is some evidence that the supply of doctors in the U.S. has been restricted in this way [16].

It is evident that individuals become more proficient at performing certain functions and develop new skills while working in a given job. For example, it seems reasonable to assume that a manager becomes more proficient in performing managerial and administrative functions as his experience in the job increases. Thus the effects of related work experience or learning by doing will also be expected to generate earnings differences (see [23]).

There are, of course, many other factors which will generate differences in earnings. For example, employers may discriminate against groups of individuals, such as women, so that their earnings will tend to be lower than those for other groups. Similarly, labour markets in different geographic areas may be quite different and these will tend to cause differences in earnings. Full-time and part-time employment and hours worked will also determine the total earnings of individuals. The effects of these all need to be considered in developing a model for statistically explaining the variation in earnings.

Formulation of the model

It follows from the preceding discussion that the earnings of individuals are determined by a wide range of factors. Some of these cannot be satisfactorily measured so that they had to be excluded from the statistical model used here. Others could not be included because the relevant data were not collected in the survey. As in all regression models, the implicit assumption here is that the excluded factors are not systematically related to earnings, so that their effects are assumed to be contained in the residual or disturbance term.

The model used assumes that the earnings of an individual are linearly related to a number of variables such as age, sex, occupation, employment status and region of residence. In statistical form the basic equation to be estimated is given by:

$$Y_i = a + \sum b_j X_{ij} + u$$

Where Y_i is the gross annual earnings of the i th individual, a is a constant term to be estimated,

X_{ij} is the value of the j th explanatory variable such as sex, for the i th individual, b_j is a constant to be estimated for each X_j

u is a random disturbance term with a mean of zero and unknown but constant variance.

This equation includes the effects of both demand and supply on earnings, and the coefficients in the equation are estimated by the method of ordinary least squares (see [21]).

An individual's occupation is determined by the work functions or duties of his job and by his job title. Since these factors are also clearly important in determining the wage offered for the job, it follows that occupation will have an important direct effect on earnings. By contrast, field of study provides a basis by which individuals are selected for employment in a given occupation; as suggested in Chapter VI, certain occupations are open only to graduates in

particular fields, but in the majority of cases the relationship is fairly loose. It follows then that field of study will affect earnings indirectly through occupation, and these indirect effects will be reflected in the estimated coefficients for occupations.

Field of study may also have other indirect effects on earnings. For example, the analysis in Chapter IV showed that graduates in some fields of study had higher degrees than those in other fields; thus the earnings of graduates in these fields will tend to be higher than those in other fields simply because of the larger proportion of graduates with a doctorate or masters degree. Similarly, the analysis in Chapter X showed that sex and field of study are closely related; thus earnings differentials by field will in part be due to earnings differentials by sex. These indirect effects of field of study will also be reflected in the estimated coefficients for type of degree and for sex.

It is not clear, however, that field of study will have a substantial direct effect on earnings, and hence that it should be included as a separate explanatory variable in the equation. Lacroix et. al. [22] have recently studied this issue and they conclude that there seems to be no reason to think that field of study itself directly affects earnings differentials; they do in fact include field of study in a regression equation of earnings, but it is used as a proxy for other factors including the innate ability of individuals, the institutional organisation of jobs, and the degree of protection in labour markets (see [22] pp. 11-15). Moreover, the empirical analysis in Chapter IX of this report suggests that earnings differentials by field of study are fairly small after standardisation for age, sex, occupation and type of degree. Thus, if field of study does in fact directly affect earnings, it seems reasonable to assume that its effects will be fairly small, so that there will only be small biases in the estimated effects of the variables included in the equation.

Age is a critical factor in determining the variation in both the slope and the peak of the age-earnings profile for each occupation. Since it was expected that the coefficients for each occupation would vary with the age of individuals in the occupation, the data were divided into four sub-files. Each sub-file represents a particular age group: 25-34, 35-44, 45-54 and 55-64. In addition an attempt was made to allow for the effects of age within each of these age groups by including a dichotomous variable specifying high/low age within the given age group.

The explanatory variables used in the model are listed in Table XI.1. These are all discrete variables, and they were entered in the equation in the form of dummy variables which take a value of one if the particular individual was in the given category (e.g. female), and of zero otherwise (i.e. male). In the estimation procedure used here, one cell for each explanatory variable had to be omitted from the equation since it would be completely determined by the other cells and hence would otherwise cause multicollinearity among the dummy variables. (see [36]). The cells which have been omitted for this reason are indicated with an asterisk in Table XI.1. It should be noted that a given coefficient b_j is then interpreted as the effects on earnings of the variable X_j compared to the excluded variable: for example, the coefficient for females in the equation provides an estimate of the earnings differential of females compared to males.

Most of the explanatory variables included in the equation are clearly defined in Table XI.1. The intention in the "gap in education" variable was to try to estimate the effects, if any, of individuals obtaining their highest degree later on in their lives. "Degree at a young age" includes (a) those with a doctorate received up to age 39, (b) those with a masters degree received up to age 33 and (c) those with other degrees (undergraduate or post-bachelor or post-graduate diploma or certificate or first professional degree in medicine, law or veterinary science) received up to age 29. It will be evident that the majority of these persons would have taken all their education over a continuous period of time, and consequently they would have been classified in the "degree at a young age" group. As noted above, the age variable simply divides persons within each age group into those at the lower end and those at the higher end of the group.

TABLE XI.1
Explanatory variables used in analysis

Region	
ATLANTIC	
QUEBEC	
*ONTARIO	
PRAIRIES	
B.C.	
Sex	
*SEXM	— male
SEXF	— female
Children in home under 17	
*CHILNO	— no children under 17 present in home in 1971
CHILYS	— one or more children under 17 present in home in 1971
Status in home	
*HEAD	— head of household
SPSE	— spouse
RELO	— other relative in household
Home Language	
*HLANGE	— English
HLANGF	— French
HLANGO	— Other
Degree Level	
*DEGEN	— (Specialised) undergraduate degree, or post-bachelor or post-graduate diploma or certificate, or first professional degree in medicine, law or veterinary science.
DEGMSR	— Masters degree
DEGPHD	— Doctorate degree
Employment Status	
*WKFL40	— working full-time 40 or more weeks
WKPF40	— working but not all full-time 40 or more weeks
WKPF40	— working or looking for work less than 40 weeks

TABLE XI.1 (continued)

Gap in Education

- *NGAP — degree at a young age
 GAP — degree at an older age
 Age
 Low — first 5 years in each age group
 *High — second 5 years in each age group

Occupation

- *OCC1 — Managerial and Administrative occupations
 OCC2 — Occupations in Physical Science
 OCC3 — Occupations in Life Science
 OCC4 — Architects & Engineers
 OCC5 — Occupations in Mathematics, Statistics, etc.
 OCC6 — Occupations in Social Science
 OCC7 — Occupations in Social Work and Related
 OCC8 — Occupations in Law and Jurisprudence
 OCC9 — Other Occupations in Social Sciences
 OCC10 — Occupations in Religion
 OCC11 — University Teaching & Related occupations
 OCC12 — Elementary & Secondary School Teaching & Related occupations
 OCC13 — Other Teaching and Related occupations
 OCC14 — Health Diagnosing and Related occupations
 OCC15 — Other Health occupations
 OCC16 — Artistic, Literary and Recreational occupations
 OCC17 — Clerical and Related occupations
 OCC18 — Sales occupations
 OCC19 — Service occupations
 OCC20 — Other occupations

*Denotes that this cell was omitted from the regression analysis to avoid perfect multicollinearity.

Data for the model

Since the unit of observation in the regression model is the individual, it would have been extremely expensive and time-consuming to have carried out the analysis on the file for all respondents. Moreover the use of all respondents would have introduced a bias in the results since the sampling fractions—and hence the proportions selected—differed for various groups of degree-holders. For this reason a random sample of 12,000 individuals was selected from the weighted population file of over 600,000 persons, and this formed the basis of the analysis.*

As noted in Appendix I, respondents had been asked to report their earnings either over the twelve month period prior to their response or for the calendar year 1972. This meant that additional variation in earnings would have been introduced because of the variation in the reference period. In order to reduce this variation, it was decided to use only the data for persons who reported earnings for the twelve months prior to response and whose response data was between September and December 1973; this left a total of 8,553 cases. This was further reduced to 7,985 observations because of the elimination of persons under 25 or over 65 years of age.

*We are grateful to David Gower of Statistics Canada for making this sample available to us.

The earnings data refer to total earnings (salaried income plus net income from self-employment) over the reference period. Home language was measured by the response to a question in the 1971 census on language most often spoken in the home. The presence of children aged 16 and under, or over 16, was also determined from census data, so that this variable provides only an approximate indicator of the presence of children at the time of the survey: the same is true for status in the home. The information on employment status, on province of residence and on occupation, refer to the longest job, or residence, in the twelve months prior to response. Type of degree refers to the highest degree earned by the date of response.

Regression results

Since the number of explanatory variables included in the regression equations is large, the results are discussed in five separate sub-sections: (a) geographic (b) demographic (c) education (d) employment, and (e) occupational factors. It was also felt that many readers would be interested in the interpretation of the results rather than in the details of the statistical tests, so that the latter have not been included here. These details are available elsewhere (See [18]).

The number of observations and the adjusted coefficient of determination for each of the four regression equations are shown in Table XI.2. The adjusted coefficient of determination (\bar{R}^2) provides a basis for judging how well an equation does in statistically explaining the variation in the dependent variable. For example, the adjusted coefficient of determination for the equation for the age-group 25-34 indicates that 37 per cent of the variation in earnings for those aged 25-34 was statistically due to the explanatory variables included in the equation; thus 63 per cent of the variation could not be explained by the equation and this is attributed to the random effects of a large number of other factors assumed to be included in the disturbance term.

TABLE XI.2
Number of observations and adjusted coefficients of determination for regression equations

Equation (Age-Group)	Number of observations	Coefficient of determination \bar{R}^2
25-34	3587	.37
35-44	2126	.45
45-54	1554	.37
55-64	718	.39

The adjusted coefficients of determination do in fact compare favourably with those generally obtained in regression analysis of earnings using cross-section data (see for example [20]). Thus the equations used appear to provide a reasonable statistical explanation for the determination of the earnings of degree-holders.

(a) Geographic factors

The data in Table XI.3 show the estimated coefficients of the various regional dummy variables and estimated constant for each of the four regression equations.

The constants are interpreted as the average earnings of persons specified by the cells excluded from the regression analysis. For example, the estimated constant of 16,597 for the 25-34 age group means that male heads of household aged 30-34 with no children under 17 in the home, living in Ontario and speaking English in the home, with a bachelors or first professional degree, who took their degree at a young age, and worked in a full-time job for 40 or more weeks, earned on average \$16,597 in the year prior to the survey. Since these constants provide a base for comparing the effects of the different variables, they are repeated later in each table giving the coefficients of the various factors.

Ontario was excluded as part of the estimation procedure, so that the coefficients are interpreted as the earnings differential between a given region and Ontario. Thus, for example, the figure of -\$702 for the Atlantic region in the equation for the 25-34 age-group means that degree-holders aged 25-34 living in the Atlantic region received on average \$702 less than those of the same age living in Ontario; all other characteristics, such as sex, employment, status, and so on, are assumed to be held constant so that their effects on earnings are the same in both cases.

TABLE XI.3

Estimated regional variation in earnings compared to Ontario (\$)

	Age-Group			
	25-34	35-44	45-54	55-64
Constant	16597	22543	25025	24799
Atlantic	-702	-4201*	-1538	-5709*
Quebec	-708*	-592	-114	-1037
Prairies	-829*	-1950*	-629	-2478*
B.C.	-359	-2090*	-1544	-3732*

*Indicates that, using a statistical test, this coefficient is significantly different from zero at the 5% level.

The coefficients which are significantly different from zero at the 5 per cent level of significance (based on a statistical F test, see [21]) are indicated with an asterisk. The level of significance of an estimate depends not only on its absolute size but also on its sampling variance and the properties of the statistical distribution being used for the test. Thus, the statistical significance of two estimated coefficients of roughly the same size may differ because of differences

in their sampling variance. For example, the estimate of -\$708 for those aged 25-34 for Quebec is significantly different from zero at the 5 per cent level of significance; by contrast, the estimate of -\$702 for the same age-group for the Atlantic region is not significantly different from zero at the same level of significance. These statistical tests provide a basis for identifying the variables which have a valid effect on earnings. Thus, one can have reasonable confidence in the validity of the sign of an estimate which is significantly different from zero, and that the corresponding variable genuinely affects earnings. For example, since the figure of -\$708 for those aged 25-34 for Quebec is statistically significant one can be reasonably confident that degree-holders aged 25-34 and with a given set of characteristics living in Quebec earned less than those living in Ontario; by contrast, since the figure of -\$702 for the same age-group for the Atlantic region is not statistically significant, one cannot be reasonably confident that degree-holders aged 25-34 and with a given set of characteristics in the Atlantic region actually earned less than those in Ontario. It should be noted that this statement is valid only for degree-holders with a given set of characteristics; thus average earnings of all degree-holders in the Atlantic region may be lower than those of all degree-holders in Ontario simply because of differences in the characteristics of degree-holders in the two regions.

The estimates in Table XI.3 are generally consistent with other analyses of regional differences in earnings in Canada. Thus earnings are higher for all age groups in Ontario than elsewhere in Canada. Moreover, the coefficients which are statistically significant indicate that the earnings differential increases considerably with age; for example, for degree-holders living in the Prairie region the earnings differential was \$800 for the 25-34 age group but \$2,500 for those aged 55-64. The estimates also suggest that degree-holders in most age groups in the Atlantic region earned lower incomes than those elsewhere in Canada.

(b) Demographic factors

The data in Table XI.4 show the coefficients for the demographic explanatory variables in the various equations. The coefficients for the age variable show that for the younger age groups, persons in the lower half of the age group earn significantly less than those in the upper half of the age-group; while the reverse is true for the older age groups, the differences are not statistically significant. This pattern is quite consistent with the general pattern of age-earning profiles which show that earnings rise steeply with age to a peak somewhere before retirement age.

The coefficients for females show that women earned less than men for all age groups. Moreover, the male-female differential increases with age, so that women aged 55-64 earned nearly \$4,000 less than men. One possible explanation for this is that employers discriminate against women and so pay them less than men. Another possibility is that many women tend to drop out of the labour force for a few years, so that women of a given age would have had less working experience than men of the same age. In this case, the earnings of men and women in the youngest age group — when experience would be at a minimum — should be much the same. The fact that the coefficient for the 25-34 age group is not significantly different from zero gives some weight to this explanation.

For language spoken in the home, the coefficients for both French and for other language groups show that they earned less than English-speaking degree-holders for some age groups. For French-speaking persons, the estimated difference increases consistently with age although it is not statistically significant for the younger age-groups. For persons with other home languages, the difference is statistically significant for all ages except the 45-54 group. The differences for French-speaking persons are also generally smaller than those for other language groups. For example, persons aged 55-64 who spoke French in the home earned \$3,000 less than those of the same age group who spoke English in the home; by contrast, those who spoke a language other than English or French in the home earned \$7,300 less than English-speaking persons.

These findings suggest that persons who do not speak English in the home might have faced some discrimination in the labour market at some time in their working lives and this could have affected both their level of earnings and the job opportunities open to them.

Two other demographic variables — presence of children under 17, and status in the home — also affect earnings. Spouses earned significantly less than heads of household for all age groups except the 55-64 group: this finding is consistent with the view that a spouse may be willing to accept a lower salary than a household head who is generally considered to be the primary earner in the family.

TABLE XI.4

Estimated earnings differentials (\$) for demographic variables
(Compared to variables in parentheses)

	Age Group			
	25-34	35-44	45-54	55-64
Constant	16597	22543	25025	24799
Age-low (high)	-2734*	-1114*	682	1171
Sex-female (male)	-371	-1856*	-3248*	-3766*
Home Language (English)				
—French	-51	-1224	-2110*	-3014*
—Other	-1624*	-3868*	-1552	-7255*
Children in the home (no children in the home)	1014*	1636*	914	-541
Status in the home (head)				
—spouse	-1641*	-2936*	-3802*	-1319
—other relative	-1574*	-1360	-2088	-1643

*Indicates that using a statistical F test this coefficient is significantly different from zero at the 5% level.

(c) Education factors

Persons who received their highest degree later on in their lives earned less than those who received their degree at a fairly young age and hence probably at the end of a continuous period in the education system (Table XI.5). This is not surprising since the former would have had less related working experience after their degree than the latter and hence would be expected to earn less. The difference also increases with age except for those aged 55-64 for whom the difference is not statistically significant.

TABLE XI.5

Estimated earnings differentials (\$) for education variables
(Compared to variable in parentheses)

	Age Group			
	25-34	35-44	45-54	55-64
Constant	16597	22543	25025	24799
Degree at an older age (younger age)	-1470*	-2437*	-2612*	-468
Type of degree				
—masters	737*	772	1199	1339
—doctorate (bachelors or first professional)	1296*	-671	2129	699

*Indicates that using a statistical F test this coefficient is significantly different from zero at the 5% level.

Individuals with a masters degree or with a doctorate also generally earned more than those with only an undergraduate degree but the differences are statistically significant only for those aged 25-34. There are two possible explanations for this. Since persons with a first professional degree in law, medicine or veterinary science were included with other undergraduate degrees, the earnings of persons in this group are biased upwards, so that the insignificant earnings differentials associated with higher degrees may simply be a statistical artifact. However, since most graduates in law, medicine and veterinary science worked in the corresponding occupations, it is likely that the earnings differentials associated with such degrees would have formed part of the estimated occupational differentials in earnings.

The other explanation, which seems more reasonable, is that persons with higher degrees earned more because of other factors, such as the occupations in which they found employment, so that the earnings differentials associated with higher degrees would be included with those for other factors. As noted in Chapter IV, the proportion of persons with different types of degrees in different occupations varied considerably; thus since earnings also varied considerably by occupation, the earnings of persons with different types of degrees would tend to

reflect some of the occupational differentials in earnings. For example, many doctorate-holders worked as university teachers so that the higher earnings of university teachers would reflect some of the higher earnings associated with doctorates.

An attempt was made to assess the validity of this argument by examining the correlation coefficients between occupation and type of degree. In general, it was found that all the correlation coefficients for holders of masters degrees were fairly small (less than .15). For doctorates, however, the correlation coefficients with the occupation "university teachers" were all substantial: they were 0.52, 0.61, 0.49 and 0.39 respectively for the age-groups 25-34, 35-44, 45-54 and 55-64. It follows that the coefficients for doctorates provide poor estimates of the contribution of such degrees to earnings, since part of their effects may well be included in the coefficients for university teachers.

As noted earlier in this chapter, the human capital model predicts that if the labour market works efficiently, higher levels of educational investment will yield higher levels of lifetime earnings. It thus predicts that persons with a masters degree or with a doctorate should earn more than those with a bachelors degree. The estimates for holders of masters do not bear out this prediction, and this suggests either that the human capital model is not valid or that labour markets do not work efficiently. The former seems more likely since the estimates contradict the prediction for all age groups. For doctorates, the estimates are not conclusive since they may be biased downwards.

(d) Employment factors

As expected, the employment status of individuals is statistically significant in determining the earnings of individuals in all age groups (Table XI.6). Thus persons who worked 40 or more weeks in the year prior to the survey, but not all on a full-time basis, earned between \$5,600 and \$8,400 less than those who spent all their time in a full-time job. Similarly, those who worked less than 40 weeks and/or looked for work earned between \$7,100 and \$9,900 less than those who worked for 40 or more weeks in a full-time job.

(e) Occupational factors

The data in Table XI.7 show the earnings differentials for persons in various occupation groups compared to those in managerial and administrative occupations. It is clear that these coefficients are on the whole much larger than those for the other variables discussed above. This suggests that the occupation of employment is one of the most important determinants of earnings differences between individuals.

As might be expected, the only occupations in which earnings exceeded those for persons in managerial and administrative occupations were law and jurisprudence and health diagnosing occupations. The coefficients were extremely large in some cases: for example, for those aged 35-44, persons working in law and jurisprudence occupations earned \$12,700 more while those working in health diagnosing occupations earned \$19,400 more than persons in managerial

TABLE XI.6
Estimated earnings differentials (\$) by employment status
(Compared to those who worked in a full-time job for 40 or more weeks)

	Age Group			
	25-34	35-44	45-54	55-64
Constant	16597	22543	25025	24799
Worked not all full-time 40 weeks or more	-5604*	-7674*	-6469*	-8376*
Worked up to 39 weeks and/or looked for work	-7085*	-9903*	-8212*	-9251*

*Indicates that using a statistical F test this coefficient is significantly different from zero at the 5% level.

and administrative occupations. For the age group 25-34, persons in religious occupations earned \$13,400 less than those in the managerial and administrative group. Persons in artistic and literary occupations and in clerical occupations also earned relatively low incomes. For example, the earnings of persons aged 35-44 in clerical occupations were \$8,500 below those for managers and administrators.

The coefficients may be used to illustrate the wide earnings differential generated by occupation. For example, for those aged 35-44, persons in health diagnosing occupations earned \$27,900 more than those in clerical occupations.

Some conclusions on the determinants of earnings

An attempt has been made in this chapter to estimate the effects of a number of different factors on the earnings of degree-holders. This was done by means of a linear regression equation in which earnings are assumed to be determined by five main factors (geographic, demographic, education, employment status and occupation). An equation was estimated for each of four age groups (25-34, 35-44, 45-54 and 55-64) so that separate estimates of the effects of the different factors are available for each age group.

It was found that roughly 40 per cent of the observed variation in the earnings of degree-holders in each age group could be statistically explained by the regression equation. The estimated coefficients were tested statistically, and it was found in general that they were significantly different from zero. This suggests that the variables included do actually affect the earnings of degree-holders, and hence that the regression equation provides a reasonable model for the determination of earnings.

In terms of the size of the coefficients, and hence of the estimated effects of the corresponding variables, some of the interesting findings are: residents aged 35-44 or 45-54 in the Atlantic, Prairie and British Columbia regions earned

substantially less than those in Ontario; females aged 35 or over earned substantially less than males in the same age group; French-speaking persons aged 45 or over, and persons who spoke neither English nor French in the home aged 25-34, 35-44 and 55-64, earned much less than English-speaking persons; individuals with a masters degree or a doctorate did not earn substantially more than those with a bachelors or first professional degree, though the estimates for doctorates may not be reliable; there was considerable variation in the estimated effects of occupation, and degree-holders in some occupations earned considerably more, while others earned considerably less, than those in managerial and administrative occupations.

Some of these findings suggest that there are large inequalities in the earnings of degree-holders in Canada. In some cases, for example region of residence, the inequalities may arise because of differences in the various labour markets; in other cases, for example for sex or home language, the inequalities may be due to discrimination which limits the earnings or job opportunities open to the various groups.

The results also raise doubts about the validity of the human capital model as a basis for planning the level of investment in education. Occupation appears to be one of the most important variables affecting earnings, so that the earnings of an individual may well depend on the job he happens to get, rather than on the profitability of his educational investment. In cases in which occupation and field of study are closely related there may, in fact, be no difference between the two concepts; for example, the investment costs of a graduate in medicine are higher than average so that the earnings of physicians and surgeons should be higher than average to compensate such individuals for their higher investment costs.

In many cases, however, graduates in a particular field of study have found employment in a range of occupations. Since the investment cost will generally be the same for such individuals, human capital theory suggests that if labour markets work efficiently they should earn the same. The estimated coefficients of the regression model used here show that this is not the case. For example, the data in Chapter VI show that nearly one-quarter of the graduates with a general arts degree worked in managerial and administrative occupations; about the same proportion worked as elementary and secondary school teachers. The estimates of the model show that the earnings differential between these two occupational groups varied from -\$3195 for those aged 25-34 to -\$6707 for those aged 45-54. Thus the earnings of these graduates varied considerably even though their investment costs were the same.

However, it is not clear that the investment costs of graduates in many different fields of study will vary substantially. For example, there is no reason to believe that the cost of a degree in one of the social sciences should differ markedly from that of one in the humanities. Nevertheless, the average earnings of these graduates differed considerably depending on the occupation in which they were employed.

TABLE XI.7
Estimated occupational earnings (\$) differentials
(compared to persons in managerial and administrative occupations)

	Age Group			
	25-34	35-44	45-54	55-64
Constant	16597	22543	25025	24799
Physical Science	-3011*	-4617*	-7714*	-5140
Life Science	-2292*	-6071*	-6352*	-4110*
Architects & Engineers	-1168*	-3361*	-4489*	-3840*
Mathematics & Related	-1066	-5334*	-7944*	-12799
Social Science	-1602*	-2175	-6228*	-6260
Social Work & Related	-3984*	-5931*	-7942*	-8050
Law & Jurisprudence	2561*	12711*	3692*	12666*
Other Social Science	-3181*	-5077*	-6376*	-6916*
Religion	-9482*	-13374*	-16257*	-14975*
University Teaching	-2955*	-1674	-3625*	452
Elementary & Secondary School Teaching	-3195*	-5175*	-6707*	-5803*
Other Teaching	-3135*	-5260*	-6910*	-5869*
Health Diagnosing	7770*	19427*	11718*	13490*
Other Health	-2213*	-4926*	-8970*	-7284*
Artistic, Literary, etc.	-3889*	-3228	-9952*	-10253*
Clerical	-4495*	-8477*	-11036*	-10238*
Sales	-1960*	-5594*	-7604*	-8592*
Service	-1871*	-4848	-7593*	-2076
Other	-3840*	-5166*	-10628	-8719

*Indicates that using a statistical F test this coefficient is significantly different from zero at the 5% level.

Chapter XII

Estimated Differences in Earnings by Sex

Introduction

In Chapter XI, the effects of a wide range of factors on the earnings of degree-holders were investigated by means of a statistical regression model. The model used was quite general and an equation was estimated for each of four age-groups. Thus the coefficients of each equation provide estimates of the contribution made by each of the determining variables in statistically explaining the variation of earnings within each age group. All of the factors included — geographic, demographic, education, employment and occupational — contributed significantly to the variation in earnings, although their effects were quite different for the various age groups. However, in each case, the coefficients were relatively large for the various occupations used, thus indicating the importance of occupational employment in determining earnings.

The focus of attention is somewhat different in this chapter. Here, a statistical regression model is used to estimate the separate effects of the different factors on the earnings of males and females. This model provides an indication of whether or not the effects of the various factors on their earnings are in fact similar. For example, does a doctorate degree have different effects on the earnings of men and women?

Because of the wide range in earnings in the various occupations, it was decided to estimate the coefficients of the model separately for degree-holders in the managerial and administrative occupation group and in social science and related occupations (excluding law and jurisprudence). These occupation groups were chosen for analysis since there was a substantial number of women in each so that some significant differences for males and females could be identified. In addition, it seems likely that hiring practices, promotion possibilities and other job-related characteristics differ markedly for the two occupation groups, so that the effects of the various factors on the earnings of men and women will differ in each case.

Method and Data

The model used in this chapter is similar to that used in Chapter XI so that the

detailed considerations which determined its form need not be repeated. The model is a linear regression model which assumes that earnings for a given sex and occupation are determined by a number of variables such as type of degree, region of residence and age.

The explanatory variables used in the model are listed in Table XII.1. These variables were all entered in the equation in dummy form in which the variable takes a value of one if the particular individual was in the given category and of zero otherwise. For example, if an individual lived in the Atlantic region, a value of one was entered for that category and a zero was entered for all other categories of the variable. As in Chapter XI, the estimation procedure necessitates the exclusion of one cell for each of the explanatory variables and these are indicated with an asterisk in Table XII.1.

The data used for estimating the coefficients of the model were the same as those used in the model estimated in Chapter XI. This consisted of a simple random sample of 12,000 drawn from the weighted total population of over 600,000 persons. The actual number of observations used for each regression equation after selection of individuals by sex and occupation is given in Table XII.2.

Regression Results

All of the explanatory variables listed in Table XII.1 were used initially in the regression equations, but the coefficients of the variable, “presence of children in the home”, did not have a significant effect on the earnings of females in the two occupations: as noted in Chapter III, the presence of children in the home affected the participation of women in the labour force so that its effects on earnings would tend to be included as part of the effects of employment factors. As a result, the variable “presence of children in the home” was excluded from the regression analysis presented in Table XII.2.

The estimated coefficients of the determining variables for each of the four regression equations are given in Table XII.2. As noted in Chapter XI, these coefficients represent the estimated contributions of the different variables to the

TABLE XII.1
Explanatory variables used in analysis

Region

ATLANTIC
QUEBEC
*ONTARIO
PRAIRIES
B.C.

Age Groups

* -34
35-54
55-64

Children in home under 17

*CHILNO — no children under 17 present in home in 1971
CHILYS — one or more children under 17 present in home in 1971

Home Language

*HLANGE — English
HLANGF — French
HLANGO — Other

Degree Level

*DEGEN — (Specialised) undergraduate degree, first degree in medicine, dentistry or veterinary science, or post-bachelor or post-graduate diploma or certificate
DEGMSR — Masters degree
DEGPLHD — Doctorate degree

Employment Status

*WKFL40 — working full-time 40 or more weeks
WKP40 — working but not all full-time 40 or more weeks
WKPFL30 — working or looking for work less than 40 weeks

*Denotes that this cell was omitted from the regression analysis to avoid perfect multicollinearity.

variation in the earnings of individuals in the particular sex-occupation group. Because of the exclusion of specific cells in the estimation procedure, the coefficients are interpreted as the contributions relative to the excluded cells. For example, the figure of -\$3506 for male social scientists living in the Atlantic region means that such individuals earned \$3,506 less than male social scientists living in Ontario: other factors are assumed to be held constant.

The estimated coefficients in each equation have been tested to determine if they are significantly different from zero in a statistical sense. These are identified with an asterisk in Table XII.2: in these cases, one can be reasonably confident that the variable concerned has a valid effect on earnings. Since one purpose of the model here is to determine whether or not the explanatory variables have different effects on the earnings of males and females, the difference between the estimated coefficients of a given variable for males and females was also tested statistically. Their statistical significance is identified in the appropriate place in the text.

The adjusted coefficient of determination (\bar{R}^2) is also given for each equation in Table XII.2. These coefficients simply indicate the proportion of the variance in earnings which has been statistically explained by the determining variables included in the given equation. For example, the figure of .421 for male social scientists indicates that 42.1 per cent of the variance in the earnings of male social scientists has been statistically explained by the model. Thus the adjusted coefficient of determination provides an indicator of how good (in a statistical sense) the equation is.

In most cases, the adjusted coefficients of determination compare favourably with those generally obtained from regression models of earnings using cross-section data, (see [20]). However, the coefficient for males in the managerial and administrative occupation group is somewhat lower than that for the other equations; thus the model here statistically explains only 17 per cent of the variance in the earnings of this group of persons. One possible explanation is that the highly aggregated age groups used were not appropriate in this case and that a large part of the variation by age was not picked up by the model. An alternative explanation is that the model is inappropriate for males in the managerial and administrative group. It may be that other factors which have been omitted need to be taken into account or that the form of the model is not valid. However, in both cases, the estimated coefficients for the variables included in the equation will be valid indicators of the effects of these variables.

The estimated constant terms of the various equations are shown in the first row of Table XII.2. These constants are interpreted as the average incomes of persons specified by the cells excluded from the regression analysis. For example, the constant of \$12,706 for male social scientists means that male social scientists living in Ontario, aged under 35, speaking English in the home, with a bachelors degree, and who worked in a full-time job for 40 or more weeks, earned \$12,706 on average in the year prior to the survey.

The constants in the four equations also provide indicators of the effects of sex and occupation on the earnings of persons specified by the excluded variables. Thus for social scientists living in Ontario, aged under 35, speaking English in the home, with a bachelors degree, and who worked in a full-time job for 40 or more weeks, males earned on average about \$3,000 more than females; for managers, the sex differential was about \$5,000. As noted in Chapter XI, it is possible that part of this difference is due to the difference in the related working experience of males and females, since many women would have spent a substantial part of their working lives out of the labour force. However, some of the difference may also be due to discrimination on the part of employers.

There are substantial differences between the earnings of males and females in the two occupation groups. Thus, males in the managerial and administrative category with a given set of characteristics earned on average about \$3,500 more than males with the same characteristics in the social science category; for females, the difference in earnings in the two occupations was on average about \$1,500. Since related working experience and hence the likelihood of promotion are clearly important for persons in the managerial and administrative occupation group, it may well be the main reason for the smaller occupational

TABLE XII.2

Estimated regression coefficients (\$) by sex and occupation
(Compared to variables in parentheses)

Explanatory Variables	Social Science & Related Occupations ¹		Managerial & Administrative Occupations	
	Male	Female	Male	Female
Constant	12706	9896	16355	11417
<u>Geographic</u>				
Atlantic	-3506*	-2346*	-5058*	-3115
Quebec	-465	-2211*	311	-1946
Prairies	-2642*	-250	-1939*	-1933
B.C. (Ontario)	-3203*	-1046	-2699*	-2810*
<u>Demographic</u>				
Age: 35-54	4410*	2747*	8179*	3528*
55-64 (-34)	3467*	3119*	8916*	2355*
Home Language:				
French	-1891	1122	-2321*	1256
Other (English)	-3587*	-1303	-4234*	-3257
<u>Education</u>				
Masters	-1459*	2121*	756	3341*
Doctorate (Bachelors)	5263*	7756*	2417	1799
<u>Employment</u>				
Worked 40 or more weeks but not all full-time	536	-6091*	-2873	-8441*
Worked up to 39 weeks (Worked full-time 40 or more weeks)	-8476*	-6241*	-11204*	-8450*
Coefficient of determination (R ²)	.421	.567	.172	.447
Number of observations	282	227	1725	150

¹Excluding occupations in law and jurisprudence.

*Indicates that using a statistical F test this coefficient was significantly different from zero at the 5% level.

earnings differential for females.

For simplicity, the estimated coefficients of the explanatory variables are discussed under four headings: (a) geographic (b) demographic (c) education and (d) employment factors.

(a) Geographic Factors

The estimated coefficients for the various regions are consistent with the findings reported in Chapter XI. For both occupation groups, male degree-holders living outside Ontario and Quebec earned significantly less than those living in these regions; by contrast, region of residence does not appear to have the same consistent effects on the earnings of females. For males in each occupation group, earnings were lowest in the Atlantic provinces; the same was true for females, although the coefficient for the managerial group was not statistically significant. For males, the coefficients for the Atlantic provinces, British Columbia and the Prairie provinces also had the same rank order in both occupation groups.

(b) Demographic Factors

As expected, the coefficients for the different age groups were positive and statistically significant for males and females in both occupation groups: this means that persons aged 35 or more in each category earned significantly more than those aged less than 35. The coefficients for males and females for a given age group also differ significantly in each occupation group, except for those aged 55-64 in the social science group; this suggests that the effects of age are different in each case. Males in the social science occupation group reached their peak earnings in the age group 35-54; although females in the same occupation group had their earnings peak in the age group 55-64, the estimate here is not significantly higher than that for the 35-54 group.

The effects of age are generally also greater for those in the managerial and administrative occupation group than for those in the social science occupation group; one exception was for women aged 55-64. This may be the result of the interrupted careers of women, since continuous working experience may be an important requirement for promotion to more senior managerial and administrative positions.

For females, none of the coefficients for language spoken in the home were statistically significant; for males, they were all statistically significant except for male social scientists who spoke French in the home. For the statistically significant coefficients, the signs are all negative indicating that persons who spoke languages other than English in the home earned less than those who spoke English.

(c) Education factors

All persons with a higher degree earned more than those with an undergraduate degree, but the differences were statistically significant only for male and female social scientists and for female managers with a masters degree.

This is not too surprising since the individual occupations within the social science category include some (such as economics, social work, psychology, and so on) which are research-oriented; thus it is to be expected that a masters degree or a doctorate may have a substantial effect on an individual's earnings in these occupations.

Although the coefficients suggest that a higher degree adds more to the earnings of females than to those of males in the social science occupation group, a statistical test of the differences between the two estimates suggests that it may not be significantly different from zero. Thus, it cannot be concluded that higher degrees have different effects on the earnings of males and females.

(d) **Employment factors**

As would be expected, employment status is an important determinant of earnings. Persons who did not work in a full-time job for 40 or more weeks of the year earned significantly less than those who did; the only exceptions were males in both occupations who worked 40 or more weeks but not all in a full-time job. For females, the coefficients for those in the managerial and administrative category were somewhat larger than those in the social science category. Because of the size of the estimated constants in the equations, it follows that women with the same characteristics in the two occupation groups who did not work in a full-time job for 40 or more weeks earned roughly the same incomes.

Conclusions

The results of the analysis in this chapter are generally consistent with those of Chapter XI; thus the earnings of degree-holders seem to depend on factors such as age, sex, region of residence and occupation.

The estimated coefficients of the explanatory variables in the model used here suggest that their effects are different for males and females. For example, region of residence appears to have a consistent effect on the earnings of males but not of females; for males, earnings in both occupation groups were lower in the Atlantic, Prairie and British Columbia regions than in Ontario and Quebec.

Similarly, age appears to have different effects on the earnings of males and females. Thus, both males and females aged 35-54 earned significantly more than those aged less than 35, but the effect was significantly greater for males than for females. The same was true for those aged 55-64, but in this case only for those working in the managerial and administrative occupation group. These results are consistent with the view that working experience and the interrupted careers of women may be an important cause of male-female earnings differentials. Since most men tend to have uninterrupted careers and hence greater working experience than women, the effects of age on earnings will tend to be greater for men than women.

The estimated coefficients for type of degree show that a higher degree contributed significantly to the earnings of both men and women in social science occupations but not in managerial and administrative occupations. This is not

surprising since many jobs in the former group are research-oriented so that a higher degree would be an asset in these cases. The results here are also consistent with the suggestion in Chapter XI that the profitability of a higher degree may depend on the occupation in which the holder of such a degree is employed.

Chapter XIII

Conclusion and Implications

Introduction

As noted in Chapter I, one of the purposes of this report was to provide a broad description of some of the data in the 1973 Highly Qualified Manpower Survey. The data cover a wide range of detailed categories, such as occupation and field of study, and they provide for the first time a basis for detailed and complete analysis and research on degree-holders in Canada. An attempt has therefore been made in this report to illustrate the scope of the data by covering a wide range of general topics with occasional analysis of detailed groups of degree-holders. The main conclusions of the analysis have already been discussed at the end of each chapter, and they are therefore not all repeated here. An attempt is made in this chapter to draw together some of the conclusions and to discuss their implications for planning enrolments in the university sector.

In the nineteen-sixties, a university degree was considered to be a highly profitable form of investment both for the individual and for the country as a whole. Governments were encouraged to expand the facilities for university education both because of the high rates of return estimated for investment in education and because of its apparent effects on the growth of the economy. It was also often argued that the development of the educational system should be geared to the growth of the economy in order that shortages of qualified manpower essential for such growth not be allowed to develop. At the same time, the proportion of young persons seeking a university degree increased rapidly, as did university enrolments.

In the early seventies the situation changed dramatically. Despite the enormous investment in education, the growth rate of the economy fell substantially and the unemployment rate started to increase. Many new graduates found that the jobs they had expected, and indeed for which they felt they had been trained, were in short supply, and many had to accept jobs or salaries below their expectations. It seemed clear that the profitability of different types of university education had fallen and surpluses of certain types of degree-holders became apparent.

The Highly Qualified Manpower Survey of 1973 was planned before these

changes occurred so that the data collected were not designed to examine these issues. The survey covered only individuals who reported that they held a degree in 1971, so that many of the degree-holders facing difficult employment prospects — the graduates since that time — could not be included in this report. Thus, the analysis here can provide only limited insight into some of the recent pressing problems concerning the demand and supply of university graduates.

Despite this limitation, some important conclusions and policy implications have emerged from this study. For example, the analysis of the relationship between the occupations and fields of study of degree-holders confirmed that employment in some occupations is open only to graduates in specific fields; however, degree-holders working in many occupations had specialised in a variety of fields, which suggests that many graduates are fairly flexible in terms of the jobs they can perform. Thus manpower planning models which translate forecasts of occupational employment into forecasts of the number of persons required with specific educational qualifications may not provide a reliable basis for planning adjustments in the university sector. These conclusions are discussed more fully in the next section of this chapter.

The analysis of earnings of degree-holders showed that their earnings are determined by a variety of factors including occupation, sex, age, region of residence and employment status. Occupation appeared to be one of the most important factors, so that the job an individual happens to get may be a very important determinant of his earnings. These results suggest that although earnings differentials clearly provide valuable information for decisions by individuals on career choice, they cannot provide a reliable basis for decisions by governments on the level of public investment required in the university sector. These implications are discussed in the third section of the chapter.

It will be clear that neither of the above approaches appears to provide a reliable method for planning enrolments in all fields in the university sector. A possible alternative is suggested in the last section of the chapter; suggestions are also made there for carrying out further analyses and for collecting additional data.

Some implications for manpower planning models (*)

The analysis in Chapter VI has some important implications for the manpower approach to planning the outputs of the university sector. One of the steps in this approach is to forecast the educational structure of different occupations and to use this to derive a forecast of the number of graduates needed at some future date. The assumption is that there is a close link between occupation and education and that this is fairly stable or predictable over time. The analysis clearly raises questions about the validity of this assumption. In many cases, there appears to be only a loose link between the occupations and fields of study of degree-holders, and the observed relationship seems to reflect the complex interaction of a number of factors such as the availability of different types of degree-holders and the changing educational requirements for various occupations.

In some occupations, such as medicine and surgery and electrical engineering, there is a requirement for graduation in a particular field of study, and the data clearly indicate that these are highly education-specific occupations. At the same time, graduates in the particular field of study sometimes did not work in the corresponding occupation: for example, while graduates in medicine worked mainly as physicians and surgeons, those in electrical engineering worked in a variety of occupations. The difference reflects the effects of a wide range of factors including the wages and employment opportunities in the different occupations in which the particular educational qualifications are useful.

The implication of this finding is that the manpower approach may be valid only in a limited number of education-specific occupations. For example, a forecast of requirements for physicians and surgeons can be translated into a forecast of requirements for graduates in medicine, and (on the basis of the existing relationship) most medical graduates may be expected to work in this occupation. By contrast, although a forecast of requirements for electrical engineers may be translated into a forecast of requirements for graduates in electrical engineering, it is much less certain that the same proportion of these graduates will find employment in the given occupation since the effects of all the other factors will probably change as well. Thus a forecast of employment opportunities for electrical engineers may not provide a reliable basis for planning enrolments in electrical engineering.

This difficulty is even more important in the case of those occupations, such as economics, which are not highly education-specific. The data suggest that employment opportunities in such occupations can be filled by graduates in a variety of fields of study, so that there can be no reliable way of deriving forecasts of graduates required in some specific fields. It therefore seems clear that the manpower approach may not be valid for occupations which are not highly education-specific.

The analysis of occupational mobility in Chapter VII tends to support these conclusions. It was found that a substantial proportion of degree-holders had

changed occupation in the period from 1971 to 1973. Most of these changes occurred between occupation groups, such as managerial and administrative occupations, architecture and engineering, and clerical occupations, rather than within these groups; this suggests that these changes represented considerable changes in duties and work functions. Moreover, the persons who had changed occupation had specialised in different fields of study, though persons in fields not closely associated with a particular occupation were more likely than the others to have changed occupation. These data therefore confirm the view that many degree-holders are highly flexible in terms of the functions they can perform. It follows that the manpower approach, which makes no allowance for adjustments which take place through changes in occupation, cannot be reliable in such cases.

To sum up, these results suggest that manpower planning models which assume that forecasts of employment in different occupations can be mechanically transformed into the number of graduates in different fields of study, may be useful only for planning enrolments in a limited number of fields. For example, this approach may be reliable for planning enrolments in fields such as medicine or law, since graduation in the particular field is required for employment as physicians and surgeons or as lawyers, and most such graduates work in the corresponding occupation. For fields such as electrical engineering or geology and related earth sciences, it is less reliable; although graduation in the particular field is required for employment as electrical engineers or as geologists, many such graduates were employed in other occupations. For most other fields, such as economics, it is even less reliable: graduation in the particular field is not at present necessary for employment in any particular occupation, and many such graduates will probably find employment in a variety of occupations.

It seems reasonable to conclude therefore that different methods should be used for planning the level of enrolments in the three types of field of study identified above. The relationship between field of study and occupation is different in each of these cases, and this difference should clearly be considered in developing an appropriate planning model.

Education and earnings

It has often been argued that it is appropriate to treat expenditures on education as an investment which is expected to yield returns in the form of higher future earnings for the individual concerned. In such a case, an individual would make a decision to take more education if it seemed likely that the costs of the additional education would yield a satisfactory return in the form of higher earnings. He would thus take more education if the investment, in time and money, appeared to be profitable. The argument also applies to government expenditures on education since society as a whole also benefits from the extra education taken by individuals. Thus it has been argued that educational facilities should be expanded if such an investment of public funds is expected to be profitable.

(*)Part of this section appears in the conclusion to Chapter VI.

There has been much controversy in economic literature about the validity of the investment approach to educational planning (see [7]). One critical assumption in this approach is that individuals develop additional skills in the educational process, and they earn higher incomes because of the different functions they can then perform. This may not, however, be valid. Individuals who take more education may be more able than those who take less education, and they may go on to earn higher incomes, not because of their education, but because of their greater ability. Another possibility is that individuals from higher socio-economic status families may be more likely to take more education and to get better paying jobs, so that earnings may be dependent on family background as well as on education. Still another possibility is that education may often be used as a filter or screen, and those who have the necessary licence or credential may thus have more opportunities for earning higher incomes (see [4] and [37]).

As noted in Chapter XI the importance of these factors could not be assessed in this report since the relevant data were not available. However, some of the analysis is consistent with the hypothesis that education acts as a screen. Since degree-holders who had specialised in some fields of study were employed in a variety of occupations, it seems reasonable to assume that the general skills developed by degree-holders may sometimes be a more important determinant of their employment than the specific skills associated with their specialisation. At the same time, the model in Chapter XI suggests that occupation has a substantial effect on the earnings of degree-holders; since only a few occupations are education-specific, it seems reasonable to assume that other factors associated with occupations, such as on-the-job training or work experience, may be more important than education in explaining earnings differentials.

These results raise some doubts about the validity of the investment approach to educational planning. In this approach, the social net returns to investment in different fields of study would be estimated using the observed lifetime earnings of degree-holders in those fields, together with the total public costs of providing the given education. The results here suggest that observed earnings will be an unreliable indicator of the future earnings of graduates in many different fields of study since the occupations they enter, and hence their working experience, will have a considerable effect on their earnings. For example, since degree-holders in the same field sometimes worked in very different occupations with very different earnings, the future earnings of such graduates could be considerably higher if they all happened to choose and to find employment in high-paying occupations.

Of course, the investment approach may provide a reasonable basis for planning enrolments in fields of study which are closely associated with certain occupations. For example, most graduates in law worked in law occupations so that in this case occupation and field of study are closely related. The higher earnings associated with this occupation can therefore be attributed to the field of law, so that they may provide a reliable basis for estimating the profitability of investment in such education.

Some suggestions for further research and additional data

This analysis therefore suggests that neither the manpower planning nor investment approaches can provide a reliable basis for planning university enrolments in all fields of study. Both approaches appear to be reliable only for fields of study closely associated with a particular occupation.

How then can government be expected to plan the level of enrolments in most fields of study? One possibility is to assume that planning at the detailed level is unnecessary for those fields of study not directly related to a given occupation. Since these fields of study are not closely related to a particular occupation, and hence to earnings, it may not really matter from an employment/earnings perspective which field of study students happen to choose. Such graduates appear to be sufficiently flexible in terms of the functions they can perform, so that they will probably be able to react to changes in the employment opportunities in those occupations not related to specific fields.

In such an approach, changes in the number of university places in fields of study not related to a particular occupation are made responsive to the demands by students for that type of education. This method has been referred to as the "social-demand" approach and was adopted by the Robbins Committee [9] for planning university enrolments in Britain. One difficulty in this approach is that the burden of adjustment rests with the students themselves, and if they react slowly to changes in the labour market, substantial shortages and surpluses may develop in particular occupations. For example, a large proportion of graduates in the humanities have been employed as teachers, so that many students in this field may also expect to find teaching jobs. However, if the demand for teachers falls over the next few years, surpluses may develop in that occupation, and many future graduates in the humanities may have to accept jobs not only in occupations other than teaching, but possibly also with lower earnings.

One way to improve the adjustment mechanism is to provide students and new graduates with reliable and up-to-date information on the earnings and employment opportunities in the occupations open to them. They will then be in a better position to make decisions about their educational and career choices, and these will also be more sensitive to changing labour market conditions. In addition, improvements in career counselling and in advice on placement may help to reduce the reluctance of some graduates to take jobs they had not previously planned to take.

The data collected in the 1973 Highly Qualified Manpower Survey clearly provide some of the information necessary for counselling and guidance. However, they give only a static picture of persons with a university degree in 1971. Many important changes have taken place since that time, and there can be little doubt that the educational and occupational choices of graduates have changed in recent years. It seems necessary then that information on education, occupations and earnings should be collected at frequent time intervals so that students can obtain a realistic picture of the effects of changing labour market conditions.

Although the 1973 Highly Qualified Manpower Survey covered only university graduates, it seems important that any future survey of this type should also include graduates from non-university post-secondary institutions, such as community colleges, which have grown in importance in recent years. Information on university graduates provides only a partial picture of the post-secondary opportunities open to high school graduates and is therefore incomplete for decision-making. The inclusion of graduates from non-university post-secondary institutions is also important for further research since little is known about the substitutability of such graduates for university graduates.

It also seems important from a research point of view that an attempt should be made to collect information on the work experience and work functions of different types of post-secondary graduates. These topics could not be explored in this report but they are probably important determinants of earnings differentials. Such data would help to provide a better understanding of the relationship between education and the labour market, and they would clearly provide a basis for improving existing economic models of educational planning.

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Appendix I

Some Limitations in the Survey Data

As noted in Chapter I, the survey data are subject to some error or misinterpretation for a number of reasons. One major weakness in the design of the questionnaire is that respondents were asked to report their activity and income "during the past twelve months". Respondents were also asked to report income from wages or salary and from self-employment separately: they were advised to report these for the calendar year 1972 if they could not estimate their income for the twelve months prior to response.

As a result, there is no common reference period for activity and income for all respondents. Since respondents were allowed to submit their completed questionnaire over the nine-month period from June 1973 to March 1974, the reference period for activity and income (based on the twelve months prior to response) could have varied from June 1972 to May 1973 for some respondents, to March 1973 to February 1974 for others. For income there are further complications since wage and salary income could have been reported for the twelve months prior to response and self-employed income for the calendar year 1972, or vice versa.

The effects of the variation in the reference period may not, however, be very important for fairly large groups of respondents. The response date was between September 1973 and December 1973, and activity and income were reported for the twelve months prior to response, in 81 per cent of the returned questionnaires. Thus the reference period for activity and income for the majority of respondents would have been September 1972 to November 1973.

Most of the analysis of activity and income in the report has been carried out on the full data set so that there is clearly some possibility of misinterpretation, particularly for small groups of degree-holders. However, it was felt that the additional variation introduced by differences in the reference period for respondents should be reduced for the regression analysis carried out in Chapters XI and XII. Thus the file used for those analyses covered only responses dated September 1973 to December 1973 and activity and income for the twelve-month period prior to response.

The data on occupation also suffer from the same weakness. For example,

respondents were asked to provide information on their current jobs, so that there is no common reference period for specifying current occupation. Similarly, respondents were asked to provide information on their jobs of longest duration in the twelve months prior to response; here, too, the time period for specifying occupation will depend on the response dates of individuals.

Some of the data used in the analysis were collected in the 1971 census and they may not therefore be accurate for the respondent at the time of response. In particular the data on marital status, status in the home, and children living at home may not be accurate since they could have changed by the time of response.

Appendix II(a)

Classification of Major Fields of Study Used in this Report

Aggregate	Detailed	
1. EDUCATION	Elementary, Kindergarten and Pre-School Education Physical and Health Education and Recreation Secondary Schooling Counselling and Guidance Educational Administration and Organization Education (unspecialised)	counselling) Social Work Sociology, (including demography, sociology of education)
2. FINE ARTS & MUSIC		
3. HUMANITIES & RELATED	History Library and Records Science Modern Language and Literature (English) Modern Language and Literature (French) Philosophy Religious Studies (including theology)	
4. SOCIAL SCIENCES & RELATED	Commerce (specialization in accounting) Commerce — Other Commerce or Business Administration (marketing, industrial relations, finance, etc.) Economics (except agricultural) Law Political Science (including military studies but excluding public administration) Psychology, Other (excluding educational psychology, school and vocational counselling and guidance) Psychology, clinical (excluding vocational	
		5. AGRICULTURE & BIOLOGICAL SCIENCES (EXCEPT HEALTH) Agriculture (excluding agr. economics, agr. engineering, landscape architecture) Biochemistry (non-medical graduates only) Biology (including non-medical biophysics) Forestry Veterinary Medicine and Science
		6. ARCHITECTURE & ENGINEERING Chemical Engineering Civil Engineering (including hydraulic, sanitary, surveying, geodesy, transportation) Electrical (including electronic) Engineering Geological Engineering Industrial Engineering (including design & systems engineering) Mechanical Engineering
		7. MEDICINE, DENTISTRY & HEALTH Dentistry Medicine, Family or General Practice Nursing (including nursing education) Pharmacy (Code 81)
		8. MATHEMATICS & PHYSICAL SCIENCES Chemistry (excluding bio-chemistry) Computer Science Geology and Related Earth Sciences (including geophysics, geochemistry, paleontology,

¹Note that many detailed fields of study used in the survey are not shown here. See HIGHLY QUALIFIED MANPOWER POST-CENSAL SURVEY 1973: Specialisations for the General set of tabulations, April 1974, Ministry of State for Science & Technology

paleobotany)
Mathematics Other (including actuarial science,
operations research, but excluding mathematical
statistics)
Physics

9. GENERAL ARTS & SCIENCE

Sciences (general)
No Major (applicable only to general B.A.)

Appendix II(b)

Aggregated Groups of Occupations (20 Categories) Used in this Report

(Code numbers are those used in the OCCUPATIONAL CLASSIFICATION
MANUAL CENSUS OF CANADA, 1971, Information Canada, Ottawa, 1971).

- 11 Managerial, Administrative and Related Occupations
- 211 Occupations in Physical Sciences
- 213 Occupations in Life Sciences
- 214/215/216 Occupations in Architecture and Engineering
- 218 Occupations in Mathematics, Statistics, Systems Analysis and
Related Fields
- 231 Occupations in Social Sciences
- 233 Occupations in Social Work and Related Fields
- 234 Occupations in Law and Jurisprudence
- 235/239 Occupations in Library, Museum & Archival Sciences & Other
Occupations in Social Sciences & Related Fields, n.e.c.

- 251 Occupations in Religion
- 271 University Teaching and Related Occupations
- 273 Elementary and Secondary School Teaching and Related
Occupations
- 279 Other Teaching and Related Occupations
- 311 Health Diagnosing and Treating Occupations
- 313/315 Nursing, Therapy and Related Assisting Occupations & Other
Occupations in Medicine and Health
- 33 Artistic, Literary, Recreational and Related Occupations
- 41 Clerical and Related Occupations
- 51 Sales Occupations
- 61 Service Occupations
- 71-99 Other Occupations

Appendix II(c)

Detailed Occupations (115 Categories) Used in this Report

(Code numbers are those used in the OCCUPATIONAL CLASSIFICATION MANUAL CENSUS OF CANADA, 1971, Information Canada, Ottawa, 1971).

MAJOR GROUP II — MANAGERIAL, ADMINISTRATIVE AND RELATED OCCUPATIONS

111 OFFICIALS AND ADMINISTRATORS UNIQUE TO GOVERNMENT

- 1111 Members of Legislative Bodies
- 1113 Government Administrators
- 1116 Inspectors and Regulatory Officers, Government
- 1119 Officials and Administrators Unique to Government, n.e.c.

113/114 OTHER MANAGERS AND ADMINISTRATORS

- 1130 General Managers and Other Senior Officials
- 1131 Management Occupations: Natural Sciences & Engineering
- 1132 Management Occupations, Social Sciences and Related Fields
- 1133 Administrators in Teaching and Related Fields
- 1134 Administrators in Medicine and Health
- 1135 Financial Management Occupations
- 1136 Personnel and Industrial Relations Management Occupations
- 1137 Sales and Advertising Management Occupations
- 1143 Production Management Occupations
- 1149 Other Managers and Administrators, n.e.c.

117 OCCUPATIONS RELATED TO MANAGEMENT AND ADMINISTRATION

- 1171 Accountants, Auditors and Other Financial Officers
- 1174 Personnel and Related Officers
- 1179 Occupations Related to Management and Administration, n.e.c.

MAJOR GROUP 21 — OCCUPATIONS IN NATURAL SCIENCES, ENGINEERING AND MATHEMATICS

211 OCCUPATIONS IN PHYSICAL SCIENCES

- 2111 Chemists
- 2112 Geologists and Related Occupations
- 2113 Physicists
- 2114 Meteorologists
- 2117 Physical Sciences Technologists and Technicians
- 2119 Occupations in Physical Sciences, n.e.c.

213 OCCUPATIONS IN LIFE SCIENCES

- 2131 Agriculturists and Related Scientists
- 2133 Biologists and Related Scientists
- 2135 Life Sciences Technologists and Technicians
- 2139 Occupations in Life Sciences, n.e.c.

214/215 ARCHITECTS AND ENGINEERS

- 2141 Architects
- 2142 Chemical Engineers
- 2143 Civil Engineers
- 2144 Electrical Engineers
- 2145 Industrial Engineers
- 2147 Mechanical Engineers
- 2151 Metallurgical Engineers
- 2153 Mining Engineers
- 2154 Petroleum Engineers
- 2159 Architects and Engineers, n.e.c.

216 OTHER OCCUPATIONS IN ARCHITECTURE AND ENGINEERING

- 2163 Draughtsmen
- 2169 Other Occupations in Architecture and Engineering, n.e.c.

218 OCCUPATIONS IN MATHEMATICS, STATISTICS, SYSTEMS ANALYSIS AND RELATED FIELDS

- 2181 Mathematicians, Statisticians and Actuaries
- 2183 Systems Analysts, Computer Programmers and Related Occupations

MAJOR GROUP 23 — OCCUPATIONS IN SOCIAL SCIENCES AND RELATED FIELDS

231 OCCUPATIONS IN SOCIAL SCIENCES

- 2311 Economists
- 2315 Psychologists
- 2319 Occupations in Social Sciences, n.e.c.

233 OCCUPATIONS IN SOCIAL WORK AND RELATED FIELDS

- 2331 Social Workers
- 2333 Occupations in Welfare and Community Services
- 2339 Occupations in Social Work and Related Fields, n.e.c.

234 OCCUPATIONS IN LAW AND JURISPRUDENCE

- 2341 Judges and Magistrates
- 2343 Lawyers and Notaries
- 2349 Occupations in Law and Jurisprudence, n.e.c.

235 OCCUPATIONS IN LIBRARY, MUSEUM AND ARCHIVAL SCIENCES

- 2350 Supervisors: Occupations in Library, Museum and Archival Sciences
- 2351 Librarians and Archivists
- 2359 Occupations in Library, Museum and Archival Sciences, n.e.c.

239 OTHER OCCUPATIONS IN SOCIAL SCIENCES AND RELATED FIELDS

- 2391 Educational and Vocational Counsellors
- 2399 Other Occupations in Social Sciences and Related Fields, n.e.c.

MAJOR GROUP 25 — OCCUPATIONS IN RELIGION

251 OCCUPATIONS IN RELIGION

- 2511 Ministers of Religion
- 2513 Nuns and Brothers (W), n.o.r.
- 2519 Occupations in Religion, n.e.c.

MAJOR GROUP 27 — TEACHING AND RELATED OCCUPATIONS

271 UNIVERSITY TEACHING AND RELATED OCCUPATIONS

- 2711 University Teachers
- 2719 University Teaching and Related Occupations, n.e.c.

273 ELEMENTARY AND SECONDARY SCHOOL TEACHING AND RELATED OCCUPATIONS

- 2731 Elementary and Kindergarten Teachers
- 2733 Secondary School Teachers
- 2739 Elementary and Secondary School Teaching and Related Occupations, n.e.c.

279 OTHER TEACHING AND RELATED OCCUPATIONS

- 2791 Community College and Vocational School Teachers
- 2792 Fine Arts School Teachers
- 2793 Post-Secondary School Teachers, n.e.c.
- 2795 Teachers of Exceptional Students, n.e.c. (& handicapped)
- 2797 Instructors and Training Officers, n.e.c.
- 2799 Other Teaching and Related Occupations, n.e.c.

MAJOR GROUP 31 — OCCUPATIONS IN MEDICINE AND HEALTH

311 HEALTH DIAGNOSING AND TREATING OCCUPATIONS

- 3111 Physicians and Surgeons
- 3113 Dentists
- 3115 Veterinarians
- 3119 Health Diagnosing and Treating Occupations, n.e.c.

313 NURSING, THERAPY AND RELATED ASSISTING OCCUPATIONS

- 3130 Supervisors, Nursing Occupations
- 3131 Nurses, Graduate, except Supervisors
- 3137 Physiotherapists, Occupational and Other Therapists
- 3139 Nursing, Therapy and Related Assisting Occupations, n.e.c.

315 OTHER OCCUPATIONS IN MEDICINE AND HEALTH

- 3151 Pharmacists
- 3152 Dietitians and Nutritionists
- 3153 Optometrists
- 3156 Medical Laboratory Technologists and Technicians
- 3159 Other Occupations in Medicine and Health, n.e.c.

MAJOR GROUP 33 — ARTISTIC, LITERARY, PERFORMING, RECREATIONAL, ARTS AND RELATED OCCUPATIONS

**331 OCCUPATIONS IN FINE AND COMMERCIAL ART,
PHOTOGRAPHY AND RELATED FIELDS**

3319 Occupations in Fine and Commercial Art, Photography and Related Fields

333 OCCUPATIONS IN PERFORMING AND AUDIOVISUAL ARTS

3339 Occupations in Performing and Audiovisual Arts

335 OCCUPATIONS IN WRITING

3352 Writers and Editors
3355 Translators and Interpreters
3359 Occupations in Writing, n.e.c.

MAJOR GROUP 37 — OCCUPATIONS IN SPORT AND RECREATION

337 OCCUPATIONS IN SPORT AND RECREATION

3719 Occupations in Sport and Recreation

MAJOR GROUP 41 — CLERICAL AND RELATED OCCUPATIONS

411 STENOGRAPHIC AND TYPING OCCUPATIONS

4111 Secretaries and Stenographers
4113 Typists and Clerk-Typists

**413 BOOKKEEPING, ACCOUNT-RECORDING AND RELATED
OCCUPATIONS**

4131 Bookkeepers and Accounting Clerks
4139 Bookkeeping, Account-Recording and Related Occupations, n.e.c.

**416 LIBRARY, FILE AND CORRESPONDENCE CLERKS AND
RELATED OCCUPATIONS**

4161 Library and File Clerks
4169 Library, File and Correspondence Clerks and Related Occupations,
n.e.c.

**417 RECEPTION, INFORMATION, MAIL AND MESSAGE
DISTRIBUTION OCCUPATIONS**

4179 Reception, Information, Mail and Message Distribution
Occupations, n.e.c.

419 OTHER CLERICAL AND RELATED OCCUPATIONS

4190 Supervisors, Other Clerical and Related Occupations, n.e.c.
4197 General Office Clerks
4199 Other Clerical and Related Occupations, n.e.c.

MAJOR GROUP 51 — SALES OCCUPATIONS

513/514 SALES OCCUPATIONS, COMMODITIES

5130 Supervisors: Sales Occupations, Commodities
5131 Technical Salesmen and Related Advisers
5133 Commercial Travellers
5137 Sales Clerks, Commodities
5149 Sales Occupations, Commodities, n.e.c.

517 SALES OCCUPATIONS, SERVICES

5170 Supervisors: Sales Occupations, Services
5171 Insurance Salesmen and Agents
5172 Real Estate Salesmen
5173 Salesmen and Traders, Securities
5179 Sales Occupations: Services, n.e.c.

519 OTHER SALES OCCUPATIONS

5199 Other Sales Occupations, n.e.c.

MAJOR GROUP 61 — SERVICE OCCUPATIONS

611 PROTECTIVE SERVICE OCCUPATIONS

6116 Commissioned Officers, Armed Forces
6119 Protective Service Occupations, n.e.c.

619 OTHER SERVICE OCCUPATIONS

6199 Other Service Occupations, n.e.c.

**MAJOR GROUP 71 — FARMING, HORTICULTURAL AND
ANIMAL-HUSBANDRY OCCUPATIONS**

711 FARMERS

7112 Farmers

**718/719 OTHER FARMING, HORTICULTURAL AND ANIMAL-
HUSBANDRY OCCUPATIONS**

7199 Other Farming, Horticultural and Animal-Husbandry
Occupations, n.e.c.

73-99 ALL OTHER OCCUPATIONS NOT ELSEWHERE SPECIFIED

